



IMPERIAL INSTITUTE  
OF  
AGRICULTURAL RESEARCH, PUSA.









ROYAL BOTANIC GARDENS, KEW

BULLETIN OF  
MISCELLANEOUS  
INFORMATION

1929

LONDON:  
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses:  
Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh;  
York Street, Manchester; 1, St. Andrew's Crescent, Cardiff;  
15, Donegall Square West, Belfast;  
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1929

*Price 12s. 8d. Net.*

THE SEPARATE NUMBERS OF THIS VOLUME WERE  
PUBLISHED ON THE FOLLOWING DATES:—

No. 1	...	...	...	...	February 12.
No. 2	...	...	...	...	March 12.
No. 3	...	...	...	...	May 9.
No. 4	...	...	...	...	June 3.
No. 5	...	...	...	...	June 26.
No. 6	...	...	...	...	July 27.
No. 7	...	...	...	...	August 28.
No. 8	...	...	...	...	October 16.
No. 9	...	...	...	...	November 18.
No. 10	...	...	...	...	December 17.

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# BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1929 ROYAL BOTANIC GARDENS, KEW

## I.—THE KENTIA PALM SEED INDUSTRY, LORD HOWE ISLAND. G. P. DARNELL-SMITH.

During my stay in Sydney, New South Wales, in January, 1928, I was so much interested in the account of the Kentia Palm Industry of Lord Howe Island, given me by Dr. Darnell-Smith, Director of the Botanic Gardens, Sydney, that I asked him to write an account of the industry and of the work of the Board of Control, for the *Kew Bulletin*. The beneficent work of the Board is largely due to the care and thought of Dr. Darnell-Smith himself, and the whole story is a remarkable romance in the realm of Economic Botany. The Islanders are, I understand, all descended from two families.

There are two "*Kentia*" Palms in Lord Howe Island, which are now known under the names *Howea Belmoreana* Becc.—the curly Palm, and *Howea Forsteriana* Becc.—the thatch Palm. O. F. Cook, however, in the *Journal of Heredity*, xviii, pp. 397-419 (1927), where he gives an interesting account of the Kentia Palms introduced to California, regards *H. Forsteriana* as the type of a new genus *Denea*, so that, according to Cook, the name of the thatch palm should be *Denea Forsteriana* (Becc.) O. F. Cook (see *Journ. Wash. Acad. Sc.* xvi. p. 392, 1926). Cook mentions in his paper that the Kentias have commenced to set fruit in California, so that their introduction to America may, in course of time, seriously affect the Industry in the Island. Two other accounts of Lord Howe Island which refer to the Palms deserve mention, one by the late Mr. J. H. Maiden, "On the Vegetation of Lord Howe Island" (*Proc. Linn. Soc. New South Wales*, xxiii, pt. 2, p. 137, 1898), and Mr. W. R. B. Oliver's account in the *Trans. and Proc. New Zealand Institute*, xlix, pp. 94 and 129 (1917).

A. W. H.

Lord Howe Island is the home of the beautiful Kentia Palms, from which each year millions of seeds are exported to all parts of the world. The Island, which is of volcanic origin, is crescent-shaped and is about 7 miles in length and from half a mile to one and three-quarters of a mile in width, and contains the small area of about 3,220 acres. It forms part of the State of New South Wales, Australia, and is situated in the Pacific Ocean, 300 miles from the coast.

On the Island there is a small but sturdy population of about 120 souls. The whole of the Island is Crown Land and the Islanders are wholly dependent upon the returns from the seeds of the palms.

Prior to 1912 the Kentia Palm Seed Industry existed on a very indifferent basis. No one really was in control and individual Islanders were exporting in accordance with their own arrangements, with the result that the seed industry developed into a chaotic state, resulting in overlapping, undercutting of prices, etc., with general dissatisfaction to the trade. The principal sufferers were the majority of the Islanders, however, and as the market had not been stabilised, they were really at the mercy of exporters on the mainland. A great measure of dissatisfaction and indeed of poverty resulted, as a consequence of which the Government appointed a Royal Commission to inquire into the control of the Kentia Palm seed trade.

Following the report of the Royal Commission, the Government, in the year 1913, appointed a Board of Control to take charge of the affairs of the Island and the trade thereof. The Board was vested with a Permissive Occupancy over the whole of the lands of the Island. Since that date a new era has developed, and particularly during recent years the Board, by a variation in the policy previously obtaining, has been responsible for the creation of extremely prosperous conditions among the small Island community.

This peculiar and unique Island industry affords a very interesting and successful practical experiment in state socialism, which probably would not be possible in any other part of the world, since the conditions which prevail in the Island are so unusual.

The seed of the Kentia Palm growing on all parts of the Island—on the holdings of the Islanders and otherwise—is regarded solely as the property of the community. On the Island a committee of three members is elected by the Islanders themselves to carry out the instructions of the Board of Control, whose headquarters are on the mainland. The Board in Sydney obtains orders from various parts of the world for the Kentia Palm seed and then arranges, through the local committee on the Island, for each Islander participating in the benefits of the seed industry to collect a certain proportion of the seed required.

As soon as the Palm seed is collected by the Islanders, it is immediately fumigated, then carefully measured and, with suitable packing (banyan soil), placed in three-bushel corn sacks containing two bushels of seed and one of the banyan soil. It is then shipped from the Island to Sydney—a journey of 48 hours—from whence it is exported to growers abroad, after being repacked in cases.

When sales are effected, the proceeds are banked by the Board, and, from such funds, outgoings in the shape of payments for collection of seed, freight, and general charges are met and the balance is held in trust for the Islanders, who receive regular monthly payments and therefore are aware precisely of what their incomes will be.

The distribution of the money to the Islanders is on a very interesting basis. An Islander attaining the age of 21 years is allotted 25 shares in the Seed Industry. This applies to males and

females alike. At the age of 31 another 25 shares are granted which brings the total holding of an adult of 31 years to the maximum of 50 shares. For children, under the age of 16 years, 15 shares per child are allotted, whilst the allotment for children over the age of 16 and under the age of 21 years is 10 shares. There is a proviso, however, that the maximum holding for children is limited to 60 shares. It is thus possible for a man and his wife to hold between them 160 shares, representing 50 shares each in their own right, and 60 towards the support of their children.

Regular monthly payments are made to the Islanders, which aggregate £2 per share per annum, and as the minimum holding is 25 shares and the total maximum holding for a family 160 shares, it will be seen that the Islanders receive from £50 to £320 per annum.

The payments just referred to do not constitute the whole of the income of the Islanders, who obtain payments varying from 6s. to 15s. per bushel for the collection of seed according as to whether it is obtained in accessible or difficult localities, and in addition for work performed for general purposes, *i.e.*, roads, care of their whale boats, etc., payment is made at the rate of 6s. per diem.

When it is remembered that land is made available to the Islanders without charge when they wish to erect dwellings, that they have sufficient areas for cultivation and grazing, that there is an abundant supply of fish, that meat is sold at the fixed price of 3d. per lb., also that Islanders can maintain themselves so far as dairy produce, vegetables, etc., are concerned, and that no rent is payable, it will be realised that they are in a singularly fortunate position.

The seed of the *Kentia* Palm is usually collected during the months of March, April, May, June and July. As a vessel calls at the Island once every five weeks only, the practice is to gather the seed a few days before the vessel arrives and thus the Islanders are not obliged to undertake continuous work in collecting. Probably the aggregate time involved in gathering the seed is no more than one month per year. Thus, through the benevolence of nature, these fortunate Islanders, with a monopoly of the *Kentia* Palm seed trade, are assured of a most comfortable existence in one of the most beautiful Islands of the world at a minimum expenditure of their time in earning their income.

Some years ago, through the unfortunate introduction of rats to the Island from a stranded vessel, grave concern was experienced as to the future of the trade, since the rats, which had multiplied in an alarming manner, first practically stripped the Island of bird life and then attacked the palm seeds. The Board was confronted with an alarming situation, but to its credit it brought such regulations into operation as not only stemmed the tide, but resulted in the keeping of the rats in check to such a degree that the seed industry is again in a flourishing condition. The vital period was during the years 1925 and 1926, and the success of the methods adopted cannot be better illustrated than by furnishing the following particulars



as to the number of bushels of seed gathered during the last nine years :—

Year	1919	...	...	...	Bushels	4,494
„	1920	...	...	...	„	3,636
„	1921	...	...	...	„	2,635
„	1922	...	...	...	„	1,664
„	1923	...	...	...	„	1,065
„	1924	...	...	...	„	1,334
„	1925	...	...	...	„	877
„	1926	...	...	...	„	955
„	1927	...	...	...	„	3,037
„	1928 (to date)	...	...	...	„	2,460

The most effective agent in rat destruction has been the barn owl, which has been introduced to the Island, and a bonus is given to the Islanders for every rat killed, the tail being produced as evidence.

On account of the scarcity of seeds during the years 1925 and 1926, some apprehension was caused amongst nurserymen, but their fears are entirely groundless as there is no probability of regular supplies being unavailable. The export of 13,666,500 seeds last year, mainly to England, France, Belgium and America, demonstrates that there is no ground whatever for any anxiety.

No reference to Lord Howe Island is complete without mention being made of its great beauty throughout. The Island is covered with a dense and most luxuriant vegetation, but from the peculiar bouldery character of the formation of the major part of the floor, it has scarcely more than 300 acres suitable for agriculture. The soil of these few acres is extremely rich and almost any sub-tropical vegetation can be grown. There are two mountains on the Island, one rising to a height of 2,840 feet, and the other, which is practically inaccessible, is 2,500 feet high. The climate is peculiarly equable. Frosts are unknown, whilst in summer the thermometer seldom rises above 80 degrees. Rain is abundant, and frequent, and the natural beauties of the Island render it most attractive to visitors.

## II.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXII.

1211. *Clematis tortuosa* Wall. Cat. 4675 ex C. E. C. Fischer [Ranunculaceae]; ex affinitate C. *Buchananianae* DC. differt indumento fulvo, foliolis acuminatis nec rugosis, paniculis paucifloris diffusis.

*Scandens*. *Rami* vetustiores fuliginosi, sulcati, pilosi pilis longis fulvis. *Folia* 5-foliolata; petiolus ad 18 cm. longus, angulatus, fulvo-pilosus vel fulvo-pubescens; foliola membranacea vel subcoriacea, ovato-lanceolata vel suborbicularia, acuminata, basi rotundata vel sinu in utroque latere petioli bisinuata, 5–13 cm. longa, 2·5–12 cm. lata, marginibus irregulariter grosse dentata vel crenatodentata, dentibus apiculatis, e basi quinquenervia, supra et infra

parce fulvo-pilosa vel nervis exceptis glabrescentia; petioluli 1.5-10 cm. longi, saepe praehehensiles, fulvo-pilosi. *Paniculae* axillares, saepissime folia vix aequantes; rami et pedicelli et bracteae densiuscule fulvo-pilosi vel ochraceo-pilosi; bracteae ovato-lanceolatae, integrae vel grossedentatae, interdum supra glabrae, 1.5 cm. longae; pedicelli 2-4 cm. longi. *Sepala* 4, erecta, apice recurvata, oblonga, obtusa, 1.5-2 cm. longa, extra dense fulvo- vel flavo-tomentosa, intus glabra vel subglabra. *Stamina* sepalis aequilonga; filamenta albo-sericea; antherae lineares, 5-6 mm. longae, truncatae. *Carpella* pilosa; styli longi, filamentosi, dense albo-sericei. *Achaenia* matura non visa.

INDIA. Silhet, *Wall. Cat.* 4675 (type); Khasia Hills, Gossain Than, *Wall. Cat.* 4676; Khasia Hills & Mishmee, *Griffith* 7, 463; Khasia Hills, Mushai, 1850 m., Sept. 1850, *J. D. Hooker and T. Thomson*; Naga Hills, Kohima, 1200 m., Jan. 1928, *F. Kingdon Ward* 7786, "In deep shade in a thickly forested glen"; Lushai Hills, Vombuk, 1500 m., Jan. 1928, *Mrs. N. E. Parry* 505.

Lushai name: Hruipawnro.

1212. ***Mucuna exserta*** C. B. Clarke MS. ex C. E. C. Fischer [Papilionaceae]; *M. bracteata* DC. proxima, distincta tamen foliolis rigidioribus tenuiter reticulatis, floribus majoribus, fructu dense fusco-setoso.

*Planta scandens*; ramulis fuscis, angulosis, striatis, superne adpresso-cinereo-puberulis. *Folia* trifoliolata; petiolis teretibus, striatis, basi incrassatis rugosisque, glabrescentibus, 3.5-20 cm. longis, circiter 0.75-2 cm. ultra foliola lateralìa productis; stipulis caducis (non visis). *Foliola* rigida; apicale rhomboideum acutum vel acuminatum, basi rotundatum, costa cum paribus 5-6 nervorum principalium supra distinctis infra prominentibus, reticulationibus ultimis tenuibus, marginibus subundulatis, supra glabrum vel subglabrum, infra adpresse cinereo-puberulum, 5-18 cm. longum, 3-11 cm. latum; lateralìa ovata latere inferiore plus minusve gibbosa, ceterum terminali similia; petiolulis 4-5 mm. longis; stipellis linearibus, 2-3 mm. longis. *Racemi* terminales; pedunculo cum rhachide usque 24 cm. longo, sulcato, cum pedicellis pilis fuscis setis irritantibus rufis longioribus intermixtis dense vestito; bracteis ovatis vel lanceolatis acuminatis, 1.5-2 cm. longis, utraque pagina fusco-ciliatis atque fusco-pubescentibus, a rhachide caducis sed basi pedunculi imbricatis plus minusve persistentibus. *Flores* 3.5-4.0 cm. longi; pedicellis 5-12 mm. longis. *Calyx* 1 cm. longus, dense fusco-ciliatus, utrinque fusco-pilosus, extraque setas irritantes rufas gerens. *Corolla* saturate purpurea; vexillo ovato-oblongo, obtuso, 2 cm. longo, glabro vel externe marginem versus subhirsuto; alis anguste oblongis, obtusis, marginibus dimidio inferiore dense fusco-ciliatis, 3 cm. longis; carina anguste naviculæformi apice resima rostrata, marginibus fere apicem usque anguste fusco-ciliata. *Stamina* carinae aequilonga. *Ovarium* dense fusco-pilosum;

stylo gracili pilis fuscis adscendentibus vestito. *Legumen* lineari-oblongum, turgidum, apice rotundatum, sine plicis vel alis, 5-7 cm. longum, setis nigro-brunneis dense vestitum.

INDIA. Khasia Hills at Mungpo, 1500 ft., October, *C. B. Clarke* 37300A (type), 37253A; *Griffith* (without no.); Garo Hills, 2000 ft., February, *C. B. Clarke* 43057A (type for fruit); Assam, *Griffith* 513 (Kew distribution 1700); Manipur at Neechungad, February, *Meebold* 5338; Lushai Hills at Kaitunkawn, 2000 ft., March, *Mrs. N. E. Parry* 651.

Lushai name: Witeme. "Flowers with an unpleasant smell." (*Parry*).

1213. ***Vernonia Parryae*** *C. E. C. Fischer* [Compositae]; quam *V. extensa* DC., cui affinis, gracilior; ramulis ramellisque sulcatis; foliis angustioribus neque serratis; inflorescentia e cymis axillaribus paucicapitulatis sistente, capitulis brevius pedunculatis, bracteis involucrelibus pilosis, pappo albo.

*Suffrutex*; ramulis ramellisque gracilibus sulcatis inferne glabris vel fere glabris, ad apices plus minusve adpresse fulvo-pubescentibus. *Folia* alterna elliptica usque linearia saepe falcata, basi in petiolum 3-10 mm. longum angustata, apice tenuiter acuminata vel caudata, 10-22 cm. longa, 1.5-3.0 cm. lata, sursum gradatim angustiora, floralia 3 mm. tantum lata, marginibus remote minute dentata, glaberrima; costa et circ. paribus 7 nervorum principalium et reticulationibus supra distinctis infra prominentibus. *Inflorescentia* e cymis axillaribus 3-5-capitulatis sistens; bracteis linearibus 1-2.5 cm. longis foliis floralibus consimilibus, prope basin fulvo-pubescentibus; pedunculis ramulisque petiolos subaequantibus fulvo-pubescentibus. *Capitula* c. 1.25 cm. diametro, c. 20-flora. *Bracteae involucreales* haud numerosae, extra laxe pilosae, intus glabrae; marginibus scariosis, linea media viridi saltem apicem versus; externae minutae late ovatae apiculatae forma internas sensim appropinquantibus loratas obtusas abrupte minute apiculatas, 7-8 mm. longas. *Receptaculum* glabrum. *Corolla* purpurea, 8-10 mm. longa. *Achaenia* gracilia costata albo-hirsuta 2.5 mm. longa; pappo albo adscendenti-barbellato 7 mm. longo paucis brevissimis interspersis.

INDIA. Lushai Hills at Vombuk, 5000 ft., January, *Mrs. N. E. Parry* 507.

1214. ***Senecio lushaiensis*** *C. E. C. Fischer* [Compositae]; ab affini *S. acuminato* Wall. foliis latioribus altius serratis semper plus minusve hirsutis, floribus in capitulo numerosioribus ligulis duobus vel tribus perfecte evolutis, bracteis involucrelibus numerosioribus atque hirsutis, recedit.

*Suffrutex*; ramellis striatis pilis brevibus multicellularibus inferne tenuiter (sursum gradatim densius) praeditis. *Folia* exsiccata supra fusco-brunnea infra saturate olivacea, elliptica usque elliptico-lanceolata, 7-10 cm. longa, 2-3 cm. lata, apice acuto

vel acuminato, basi in petiolum crispulo-hirsutum 0.75-1.25 cm. longum angustata, costa cum paribus 5-6 nervorum principalium infra prominente, reticulationibus infra distinctis, nervis venisque utrinque plus minusve breviter fusco-crispulo-hirsutis, marginibus serratis. *Inflorescentia* e corymbis axillaribus paucicapitulis sistens; pedunculis primariis secundariisque cum bracteis phyllariisque extra plus minusve dense pilis brevibus fuscis multicellularibus crispulis vestitis; bracteis inferne foliiformibus, superne minutis linearibus. *Capitula* campanulata, 7 mm. diametro, 7-10-flora quorum duo vel tres ligulatae ceterae tubulares; bracteis involucrialibus liberis, 8, 2 vel 3 minutis extra nonnunquam additis, lineari-lanceolatis, subacutis vel obtusis, 4-5 mm. longis; receptaculo fimbriato. *Flores* laete flavi; corolla ligulata 7 mm. longa anguste oblonga, plerumque integra obtusa, quinquenerve, stylis truncatis minute penicillatis; corolla tubulari infundibuliformi, 6 mm. longa, stylis crassioribus quam in floribus ligulatis, antheris breviter caudatis, caudis connatis. *Achaenia* cylindrica sursum leviter ampliata, 2 mm. longa, 5-costata, glabra; pappo albo, adscendenti-barbellato, 5 mm. longo.

INDIA. Lushai Hills at Phongpui, 7000 ft., January, Mrs. N. E. Parry 574.

1215. *Lobelia sinaloae* Sprague [Campanulaceae-Lobelioideae]; affinis *L. Hartwegii* A.DC., a qua foliis grossius dentato-serratis, racemo brevius pedunculato, floribus majoribus recedit.

*Herba* 60 cm. alta; caulis juxta basin 6 mm. diametro, 15 cm. supra basin 4 mm. diametro, leviter flexuosus, fusco-purpurascens praesertim inferne, minute patenter pilosulus, inferne sparsius, superne densius. *Folia* patula, sessilia, internodiis 1-3 cm. longis discreta, oblongo-lanceolata vel nonnulla oblanceolata, inferiora ad 9 cm. longa et 3 cm. lata, cetera plerumque 4.5-6.5 cm. longa, 1-1.8 cm. lata, in basin brevius longiusve angustata, apice acuminata acutissima, crebriusculae argute dentato-serrata, supra viridia dense sed inconspicue breviter argute pilosa, subtus albida sparsius pilosa. *Racemi* caulem et ramum lateralem terminantes, internodiis 5-7.5 cm. a folio superiore discreti, 13-15 cm. longi, secundiflori, 13-16-flori; pedicelli 2-3 mm. longi; bractee arcuato-recurvae, subulato-lanceolatae, inferiores 1.5-1.7 cm. longae, argute serrato-marginatae. *Flores* pedicellis procurvis descendentes. *Calycis* tubus cupularis, 3.5 mm. longus, breviter dense pilosus, valde 10-costatus, costis sepalinis et intersepalinis; lobi subulato-lanceolati, 9-10 mm. longi, laxiusculae serrato-marginati, utrinque densiusculae breviter pilosi. *Corolla* violacea; tubus a basi deflexus, 1.5 cm. longus, 3 mm. diametro mediano, 2 mm. diametro transverso, inconspicue 5-costatus, extra brevissime pilosus, intus inferne pilosus, superne glaber, dorso haud fissus; limbus in tubo oblique insertus, diametro mediano 1.5 cm., diametro transverso paullo minore; lobi utrinque extus magis papillati; lobi anteriores late obovati, apiculati, 6-7 mm. longi, 5-6 mm. lati; lobi posteriores

spathulati, acuminati, 8 mm. longi, 3.3 mm. lati. *Filamenta* supra medium connata (seu potius cohaerentia), posteriora 1.3 cm., anteriora 1.2 cm. longa; tubus extra, et intus superne glaber, intus inferne pilosula; filamentorum partes liberae extra sparse intus densiuscule pilosae; antherae posteriores 3.5 mm., anteriores 2.5 mm. longae, omnes apice pilis candidis penicillatae, ceterum glabrae.

MEXICO. Sinaloa: described from a living plant raised by Mr. T. Hay, Hyde Park, from seed sent by Mr. W. J. Jessop, Mina La Tuna, Tarahumar, San José de Gracia, Sinaloa.—Also collected in the Sierra Madre, N. W. Mexico, Seemann 2048, and in Sinaloa or Nayarit by J. Gonzalez Ortega 1575.

*Lobelia Sinaloae* is very closely related to *L. Hartwegii* A.DC. Another related species, *L. velutina* Mart. et Gal., was erroneously reduced by Hemsley (Biol. Centr.-Amer. Bot. ii. 267; 1881) to *L. Hartwegii* A.DC., and was subsequently re-described by Wimmer in 1924 as a new species, *L. setulosa*.

1216. **Lisianthus Francisiae** Sprague [Gentianaceae-Tachiinae]; affinis *L. axillari* (Hemsl.) Kuntze, foliis multo majoribus pro rata angustioribus in basin angustatis membranaceis recedit.

*Planta* verisimiliter herbacea, caule patule ramoso fistulari terete viridi exsiccando hyalino-costato, 2.5 mm. diametro 20 cm. infra apicem; internodia 2.5–8.5 (plerumque 3–6) cm. longa. *Folia* subsessilia, vagina brevi communi scariosa connexa, elliptico-lanceolata, longiuscule acute acuminata, in basin subcuneatim angustata, 5–11 cm. longa, 1.8–3.5 cm. lata, membranacea, glabra; nervi laterales primarii utrinque singuli valde obliqui, demum arcuato-ascendentes  $\frac{1}{2}$ – $\frac{1}{4}$  supra basin folii orti. *Inflorescentia* axillaris, floribus (vel rarius cymulis 2–3-floris) solitariis in axillis; pedunculus 3–7 mm. longus, apice minute bibracteolatus; pedicelli 1.3–1.5 cm. longi, hyalino-costulati. Sepala subulato-lanceolata, 9–10 mm. longa, 1.5–1.75 mm. lata, late hyalino-marginata, valde carinata. *Corolla* anguste infundibuliformis, 4–5 cm. longa; tubus angustus basalis 1.6–1.8 cm. longus; pars inflata 1.5–2 cm. longa; lobi ovato-oblongi acuminati, 9–10 mm. longi, 4 mm. lati. *Stamina* inaequalia, circiter 1.5 cm. supra basin tubi inserta, majora stylum aequantia; antherae oblongae 3 mm. longae, connectivo obtuse apiculato. *Stylus* corollae lobis paullulo superatus, stigmatibus manifeste bilobis.

BRITISH HONDURAS. Corozal, Miss E. K. Francis 1.

The type-specimen of *L. axillaris* (Hemsl.) Kuntze is a small piece of shoot only four inches long, and bearing four pairs of young leaves and six flowers in various stages. It agrees, however, so far as the material goes, with Bernoulli and Cario's no. 1798, from Peten, Guatemala, which is much more complete. Hence the latter specimen has been accepted as representative of *L. axillaris* for purposes of comparison with other species. The differences between it and *L. Francisiae* appear to be mainly, if not entirely, confined to the vegetative part of the plant. In addition to the characters mentioned

in the diagnosis *L. Francisiae* apparently differs in being herbaceous, and freely branched, whereas *L. axillaris* has woody unbranched shoots up to 40 cm. long.

1217. ***Eria apertiflora* Summerhayes** [Orchidaceae-Epidendreae] ; affinis *E. convallarioidi* Lindl., a qua foliis latioribus, racemis bene longioribus et laxioribus, floribus majoribus, tepalis patentibus differt.

*Epiphytica*. *Pseudobulbi* cylindrico-clavati, pauciarticulati, compressi, ad 16 cm. longi, 2-2.2 cm. diametro, cataphyllis grandescens-entibus acutis brunneo-maculatis vestiti, apice foliati. *Folia* 3-4, oblongo-lanceolata, acuta, 13-19 cm. longa, 3-5.5 cm. lata, subcoriacea. *Racemi* 2-3, ex axillis cataphyllorum superiorum orientes, horizontali vel nutantes, subdensiflori, multiflori, 10-13 cm. longi, 2-2.5 cm. diametro ; rhachis et pedicelli dense puberuli ; bractae inferiores oblongo-ovatae, pallide brunneo-maculatae, valde concavae, superiores oblongo-lanceolatae, flavae, omnes glabrae, pedicellis satis longiores. *Sepalum* dorsale lanceolato-ovatum, obtusum, 6.5 mm. longum, 3 mm. latum ; sepala lateralia subfalcate oblongo-ovata, obtusa, 5.5 mm. longa, 3 mm. lata, mentulum perbreve, rotundatum formantia, basi puberula ; omnia sepala alba. *Petala* elliptico-lanceolata, obtusa, 5-5.5 mm. longa, 2-2.5 mm. lata, alba. *Labellum* breviter unguiculatum, trilobum, in toto 4 mm. longum ; lobi laterales triangulares, obtusi, albi ; lobus intermedius rotundato-deltoides, apiculatus, flavus, verrucosus. *Columna* crassa, 1.5 mm. longa, alba.

INDIA. Assam : collected by *Mr. G. L. Hinde* and flowered at the Royal Botanic Gardens, Kew, September 1928.

1218. ***Polycynis breviloba* Summerhayes** [Orchidaceae-Vandae] ; a *P. vittata* Rchb. f. floribus minoribus, labelli lobo intermedio acuminato lobis lateralibus brevissimis rotundatis nec incurvis basi lata sed vix auriculata, ab omnibus aliis speciebus labelli disco calvo differt.

*Pseudobulbi* ovoidei, valde compressi, 4 cm. longi. *Folia* elliptico-oblonga, acuminata, subchartacea, petiolata, in toto usque ad 22 cm. longa et 6 cm. lata. *Scapus* erectus, circiter 35 cm. altus, teres, cataphyllis vaginatis paucis obsitus ; racemus 16 cm. longus. *Flores* erecto-patentes ; bractae lineares vel lineari-lanceolatae, acutissimae, ovario pedicellato duplo vel triplo breviores ; pedicelli ut rhachis breviter pubescentes, graciles, 1.5-2 cm. longi. *Sepala* lanceolata, lateralia subobliqua, subacuta, 1.6-1.8 cm. longa. *Petala* linearia, acuta, 1.6-1.8 cm. longa, 1.2 mm. lata. *Labellum* trilobum, basi vix auriculatum ; lobi laterales brevissimi, rotundati ; lobus intermedius e basi angusta trilobulatus, lobulo intermedio acuminato, lobulis lateralibus patentibus rotundatis, in toto 8-9 mm. longus, lobulis lateralibus inclusis 6 mm. latus ; labellum basi carinis tribus instructum, lateralibus prominulis brevibus, intermedia in

labelli lobum intermedium decurrente apice exsurgente et bifida. *Columna* gracillima, 1.4 cm. longa.

Cultivated and flowered by *Messrs. Sander & Sons*, St. Albans, in September, 1928, and believed to be from Brazil. Sepals greenish-yellow, petals yellow and lip white, all with transverse purplish-red bars. Column light green, anther-cap yellow.

**1219. *Cymbopogon Parkeri* Stapf** [Gramineae]; affinis *C. Schoenantho* Spreng., sed foliorum vaginis basalibus basin versus lanuginoso-villosis, laminis arcte plicatis hincinde laxe longe tenuissime pilosis, panicula longiore laxiore, racemorum villis brevioribus ideoque racemis ipsis minus mollibus saepe subsquarrosis, articulo infimo racemi sessilis saepe cum pedicello adjacente tumido alte fuso, spicularum fertilium gluma inferiore magis in dorso excavata, imprimis basin versus ibique lanulosa.

*Gramen* perenne, compacte, caespitosum, innovationibus intravaginalibus numerosis, ad 1 m. altum. *Culmi* erecti, subgraciles, 3-4-nodi simplicesque infra inflorescentiam, teretes, glabri. *Foliorum* basaliium vaginae 5-10 cm. longae, firmae, pallidae, basin versus lanuginoso-villosae, sursum glabrescentes, diu persistentes, tandem ut videtur, haud tortae, culmorum arctae, virescentes, glabrae, laevissimae; ligulae scariosae, rotundato-truncatae, 1.5 mm. longae; laminae plicatae, anguste lineares, sursum longe filiformiter attenuatae, ad 20 cm. longae, explanatae 3 mm. latae, glaucescentes, nervis primariis utrinque 3 prominentibus, secundariis numerosis arcte approximatis, facie inferne laxe pilosae pilis nonnullis hincinde longissimis tenuissimis, et ad nervos scabrae, dorso ubique scaberulae. *Panicula* spatheata, angusta, interrupta, ad 40 cm. longa, 6-7-noda, internodiis inferioribus 10-16 (rare 20) cm. longis, caeteris sursum cito descrentibus (quarto 3-4.5 cm. longo), subgracilibus glabris; ramus primarius infimus, rarius atque sequens, ad 12 (raro 20) cm. longus, basi plerumque simplex, internodio infimo demum exserto quasi pedunculum paniculae partialis referente; rami sequentes e basi in radios 2-3 filiformes 2-4 cm. longos simplices vel 1-3-nodos glabros vaginis subtendentibus magis minusve inclusos divisi, hisce vaginis laminiferis vel superioribus elaminatis et spathoideis; spatheolae anguste lanceolatae, 3-2.5 cm. longae, scariosae, pallide stramineae, interdum subrubescences, elaminatae, glabrae; pedunculi circiter 1 cm. longi, glabri, tenuiter filiformes. *Racemi* 2-nati, demum divaricati, uno saltem epinastice deflexo, 1.5 cm. longi, albo-villosuli, unus sessilis, alter basi internodio basali gracili 1.5 mm. longo suffultus; articulus infimus racemi sessilis cum pedicello adjacente saepe tumido duro villosulo alte fusco; articuli fertiles infimi apice in cupulam dentatam ampliati, caeteri lineares, sursum leviter dilatati, apice truncati, in dorso et ad angulos albo-villosi, villis lateralibus ad 2 mm. longis. *Par spicularum* infimum racemi sessilis homogamum, racemi alterius heterogamum. *Spiculae fertiles* lineari-lanceolati, acuminati, 4 mm. longi; callus brevissimus, barbulator. *Glumae*

subaequilongae ; inferior chartacea, inter carinas scaberulas magis minusve concava et imprimis basin versus depressa et ibi minute villosula, apice bidenticulata ; superior navicularis, a latere anguste lineari-lanceolata, mucronulata, tenuis, 1-nervis, carina scaberula, ad margines hyalinos superne ciliata, caeterum dorso basin versus pilosula. *Anthoecium inferius* ad lemma hyalinum enerve lanceolato-lineare ciliatum 3 mm. longum redactum. *Anthoecium superius* ♂: lemma angustum, 2 mm. longum, fere ad medium bifidum, hyalinum, lobis ciliatis ; arista gracillima, 9 cm. longa, ad  $\frac{1}{2}$  a basi geniculata, torta, columna laevi. *Antherae* 2 mm. longae. *Spiculae* pedicellatae plerumque oblique patentes, lanceolato-lineares, 5.5–6 mm. longae, glabrae, sub anthesi late hiantes, pallide glaucae vel leviter rubro suffusae ; glumae scaberulae, inferior 7–9-nervis inter carinas, superior paulo brevior atque 3-nervis. *Lemma* anthoecii inferioris subulatim involutum, glumis paulo brevius, subenerve, ciliatum. *Antherae* 3 mm. longae.

INDIA. United Provinces, very common in the Ettawah afforestation area, Aug. 1923, R. S. Pearson.

1220. **Catalepis** *Stapf et Stent* [Gramineae] ; genus novum e tribu *Chloridearum*, caeterum sedis dubiae, spiculis in ramulos breves dispositis arcte approximatis spicam spuriam secundam constituentibus muticis unifloris, rhachilla continuata, gluma prima minuta fere subuliformi, secunda lemma aequante et ei simili insignis.

**Catalepis gracilis** *Stent & Stapf*. Species unica.

*Gramen* perenne, gracile, caespitosum, 25–30 cm. altum, rhizomate brevi tenui, innovationibus intravaginalibus. *Culmi* erecti vel geniculato-ascendentes, 3-nodi, glabri, internodiis inferioribus magis minusve compressis. *Foliorum* basaliurn vaginae demum apertae et laxiusculae, 2–4 cm. longae, superiorum arctae, omnes glabrae laevesque, superne nervoso-striatae ; ligulae ad pilorum brevium seriem redactae ; laminae anguste lineares, setaceo-convolutae, flexuosae, ad 14 cm. longae, 1 mm. latae, subglaucae, glaberrimae, sursum tenuiter scaberulae. *Panicula* spiciformis, secunda, compressa, densa, ad 3–5 cm. longa, 4 mm. lata, ex albido et griseo-roseo variegata ; rhachis primaria acute angulata, ad angulos scabra, 0.4 mm. lata, internodiis intermediis ad 3 mm. longis, caeteris multo brevioribus ; rhaches secundariae ad 2–5 mm. longae, tenues, spiculas paucas vel ad 9 gerentes. *Spiculae* sessiles, nodulis annulo niveo-scabro circumdatis insidentes, lineari-lanceolatae, acutae, a latere compressae, 4–5 mm. longae, 0.8–1 mm. latae, callo minuto albo-pilosulo, totae deciduae ; rhachilla 0.5–0.6 mm. longa. *Gluma inferior* ad squamulam involutam subuliformem asperulam vix 1 mm. longam redacta, superior membranacea, a latere visa subfalcata, anguste linearis, acuminata, explanata lanceolato-linearis, carinata, ad carinam scabridula, 1-nervis, basi albido-virescens, caeterum purpurascens. *Lemma* glumae superiori simile et aequilongum, sed 3-nerve et paulo latius, intra nervos



laterales sursum evanescentes utrinque fasciculo vel serie pilorum alborum notatum, caeterum glabrum, carina percurrente vel breviter excurrente. *Palea* lemmate paulo brevior, subhyalina, tenuiter 2-nervis, truncata. *Lodiculae* minutae. *Stamina* 3; antherae lineares, 1.5 mm. longae. *Stigmata* anguste plumosa, ut videtur ex apice anthoecii exserta

TRANSVAAL. Ermelo District; Ermelo Nooitgedracht, sandy veld near vlel, 1700 m., *Potter* (in National Herb. Pret. Henrici 1595).

*Catalepis* (from *κατα* and *λέπις*, in allusion to the scale-like basal glume) is one of those monotypic genera which owing to far-going modifications have lost the characters which otherwise might serve us as links in working out their relationship. Its position in *Chlorideae* can hardly be questioned, but its precise place in the tribe is at present uncertain.

### III.—GARDENIA OR WARNERIA. T. A. SPRAGUE.

The generic name *Warneria* (*Varneria*) L.\* *Amoen. Acad.* iv. 136, 138 (1759) was adopted in 1912 by Mr. H. C. Skeels (U.S. Dept. Agric. Bur. Pl. Industry, Bull. 242, 14), in place of *Gardenia* Ellis (1761), and the binominal *Warneria augusta* L.\* in place of *Gardenia jasminoides* Ellis. In 1914 Mr. Skeels (U.S. Dept. Agric. Invent. Seeds & Plants Imported, no. 32, 18), proposed the new combination *Warneria Thunbergia* for *Gardenia Thunbergia* L. He contended that "under present rules of botanical nomenclature"—by which, apparently, he meant the "American" Code—*Warneria* was effectively published by the use of the binominal *Warneria augusta* and the citation of a previously published description (*Catsjopiri* Rumph. Herb. Amboin. vii. 26, t. 14, fig. 2). The name *Gardenia* having in consequence been suggested to the writer for conservation, the circumstances attending the publication of *Warneria* have been investigated with the result that the latter name has been found to be *invalid* under International Rules. Hence there is no need to conserve *Gardenia*, as it is the earliest valid name for the genus.

The name *Warneria* appeared in a revised and enlarged edition of Stickman's dissertation on the 'Herbarium Amboinense' (1754), published in Linné's 'Amoenitates Academicæ' in 1759. Examination of Stickman's dissertation shows that its object was to give the Linnean, and, in default of these, the pre-Linnean, equivalents of the Rumphian names: "Cum pretiosissimum opus ad oras nostras nondum pervenerat, cum D.D. Praeses *Species suas plantarum*

\*Skeels attributes *Warneria* and *W. augusta* to Stickman, but Merrill (*Interpr. Rumph. Herb. Amboin.* 33), points out that at all events the names published in the 1759 reprint of the *Herbarium Amboinense* must be credited to Linné. He ascribes the new names in the original edition of Stickman's dissertation also to Linné on the following grounds: "the work was done under Linnaeus's inspiration and direction, and the reductions of the Rumphian species must have been made largely, if not wholly, by him."

edidit, factum, ut hujus Synonyma, quae maxime illustrarent plantas indiae rarissimas non potuerint assumi, proinde operam meam non displicituram fore Botanicis crediderim, dum *plantas Rumphii* cum Domini Praesidis Herbario contuli, ut *Synonyma* eruerem et connecterem " (Stickm. Herb. Amboin. 6).

The table of identifications is in three columns, the first giving the number of the plate, the second, the name used by Rumphius, and the third, the corresponding name in the 'Species Plantarum,' or used by some pre-Linnean author. Thus vol. i. tt. 1-3, *Calappa* Rumph., is identified as *Cocos nucifera* [L. Sp. Pl. 1188], and t. 30, *Soccus arboreus major* is identified as *Nanca* Hortus Malabaricus iii. t. 26. The occurrence of the name *Nanca* in the third column does not mean that either Stickman or Linné *accepted* that name: it merely indicates Stickman's belief that *Soccus arboreus major* Rumph. and *Nanca* Rheede are conspecific. The Rumphian species did not receive a valid binary name until 1776, when Thunberg redescribed it as *Rademachia integra* (Vet. Akad. Handl. Stockh. 1776, xxxvii. 254); five years later the younger Linné re-named it *Artocarpus integrifolia* (Suppl. 412).

As pointed out by Merrill (Interpr. Rumph. Herb. Amboin. 33), over twenty *new* binominals were published in Stickman's dissertation. These were based on the figures and descriptions given by Rumphius, and are therefore valid under International Rules. In some cases Linné retained part of the Rumphian name: thus he proposed the combinations *Garcinia celebica* for *Mangostana celebica* Rumph., and *Psidium Cujavus* for *Cujavus agrestis* Rumph. *Arbor alba* Rumph., turned into Greek, became the trivial name of *Myrtus Leucadendra*. In other cases the new Linnean names were entirely different from those used by Rumphius. In nine instances† new diagnoses were supplied: these were reproduced in L. Syst. Nat. ed. 10 (1759), that of *Piper decumanum*, however, in an amplified form. The absence of diagnoses in the other cases does not invalidate the names in question, since they are associable with the descriptions given by Rumphius.

The name *Warneria augusta*, however, falls into a different category, as it was *not based on a reference from Rumphius*, but on a specimen in Linné's herbarium, and on drawings and a living plant sent to Linné by some of his correspondents. Linné merely identified *Catsjopiri* Rumph. with his new genus and species, *Warneria* (*Varneria*) *augusta*, which he had already described in manuscript. For reasons given below the name *Warneria* was rejected in favour of *Gardenia* when a description of the genus was eventually published.

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†*Rhizophora caseolaris*, *R. corniculata*, *Adenanthera falcata*, *Ricinus Mappa*, *R. Tanarius*, *Hernandia ovigera*, *Convallaria fruticosa*, *Menispermum flavum*, *Piper decumanum*. The trivial in these cases is followed immediately by the diagnostic phrase, from which it is separated merely by a comma, so that it is not immediately obvious that the names are binominals. They appear as binominals, however, in the systematic list ('Flora Amboinensis') which follows.

The early history of the names *Warneria* and *Gardenia* is summarized below. Further details may be found in Ellis's correspondence with Linné (J. E. Smith, A selection of the correspondence of Linnaeus, vol. i. pp. 99-106, 110-114, 120-122, 127-128, 130, 134-136, 139, 146, 158 : 1821).

The shrub known as the "Cape Jasmine" (*Gardenia jasminoides*) was introduced about the year 1754\* by Capt. Hutchinson of the Indiaman "Godolphin," who found it growing near the Cape of Good Hope, and on his arrival in England presented it to Richard Warner of Woodford, Essex. As Warner experienced great difficulty in propagating it, he was persuaded by John Ellis, who had been elected a Fellow of the Royal Society in 1754, to give two cuttings to James Gordon, a gardener of Mile End. Gordon was successful in raising a stock of over a hundred plants, and the species seems to have been in cultivation ever since.

Ellis dissected many dried as well as fresh specimens of the "Cape Jasmine," and satisfied himself that it belonged to quite another group from the true jasmines, the fruit being inferior instead of superior as in *Jasminum*. He accordingly wrote to Linné, in July, 1758, sending him a specimen, a description, and a drawing with analyses of the "Cape Jasmine," and asking him to name it in honour of Warner. Ellis also referred to the figure and description of the species published by Miller under *Jasminum*. Linné's manuscript description of *Warneria*, however, was drawn up (in December, 1758, or January, 1759), not from this material, but from a dried specimen from the East Indies which he had discovered in his herbarium. This specimen therefore was the type of the name *Warneria augusta* L., the specimen sent to Linné by Ellis being merely a paratype.

In 1759 Linné brought out a revised edition of Stickman's 'Herbarium Amboinense' in the 'Amoenitates Academicæ' (iv. 112-143), adding a list of identifications of the thirty plates in the seventh volume ('Auctuarium') of Rumphius's work, which was not published until 1755, after the appearance of Stickman's dissertation. In this enlarged edition Linné gave the new name, *Warneria* (*Varneria*) *augusta* (Amoen. Acad. iv. 136, 138), as the equivalent of *Catsjopiri* Rumph. (Herb. Amboin. vii. 26, t. 14, fig. 2), and placed it in *Pentandria Monogynia*.

It is clear that *Warneria augusta* L. was not based on *Catsjopiri* Rumph. In the first place, Linné's description of *Warneria* (afterwards published in Gen. Pl. ed. 6, under *Gardenia*) was drawn up *before* the identification of *Catsjopiri* with *Warneria*. Secondly the information contained in the description and figure of *Catsjopiri* was insufficient to classify it according to Linné's system. The flower figured by Rumphius was double, with eighteen petals, and the number of stamens was not mentioned ("stamina quaedam brevia"),

\*Miller (Fig. Pl. Gard. Dict. ii. 120 : Aug. 1757) stated that the Cape Jasmine "Continued flowering great part [sic] of the voyage to England, where it arrived in good health and has for three years continued flowering in the curious garden of Richard Warner Esq., at Woodford, in Essex."

so that Linné could not even have placed it in *Pentandria Monogynia* from the details given by Rumphius.

Had Linné published *Warneria* with a description in the tenth edition of his "Systema Naturae," citing Warner's specimen and the East Indian one in his herbarium, no one would have jumped to the erroneous conclusion that *Warneria* was typified by *Catsjopiri*. The omission of the genus was due partly to Linné's uncertainty regarding the nature of the fruit, and the number of perianth segments, whether five or six ; it was, however, mainly due to the fact that he objected strongly to the suggested *adjectival* generic name *Augusta*, which had been substituted for *Warneria* by Ellis. Eventually (Oct. 1760) Linné agreed to Ellis's further suggestion that the new genus should be called *Gardenia*, but only on condition that Ellis himself published the name.

In the meantime, the "Cape Jasmine" had been described and figured by Philip Miller under the phrase-name *Jasminum foliis lanceolatis oppositis integerrimis calycibus acutioribus* (Fig. Pl. Gard. Dict. ii. 120, t. 180 : 1757 ; Gard. Dict. ed. 7, n. 7 : 1759) and by Ehret as *Jasminum? ramo unifloro, pleno, petalis coriaceis* (Pl. et Pap. rar. t. 15 : 1759). The first effective publication, however, of a new generic and a binary specific name for the "Cape Jasmine" was by Ellis, as *Gardenia jasminoides* Ellis (Phil. Trans. Roy. Soc. li. 935, t. 23 : 1761). Hence not only the generic name *Warneria*, but also the specific epithet *augusta* fall into synonymy. Ellis explained the change of name as follows : "Mr. Warner, refusing to have it so called *Warneria*, and chusing [sic] that it should still remain a jasmine, as it is commonly called, I have thought no man more worthy, as a botanist, than our friend Dr. Garden ; accordingly the professor [Linné] has agreed to adopt this new genus by the name of *Gardenia*" (l.c. 934). The generic name *Gardenia* was in fact accepted by Linné (Sp. Pl. ed. 2, 305 : Gen. Pl. ed. 6, 116), who, however, substituted the trivial name *florida* for *jasminoides*.

It may be pointed out that, even if the generic name *Warneria* and the binary combination *Warneria augusta* were based on the description and figure of *Catsjopiri* Rumph., they would still be invalid under International Rules, since the flower of *Catsjopiri* was "monstrous," and a name based on a "monstrosity" must be rejected (Art. 51, 3°).

The more important synonymy of *Gardenia* and that of its type-species, *Gardenia jasminoides*, are given below.

**Gardenia** Ellis in Phil. Trans. Roy. Soc. Lond. li. 935, t. 23 (1761) ; Sol. l.c. lii. 654, t. 20 (1762) ; L. Gen. Pl. ed. 6, 116 (1764) ; Phil. Trans. Abridg. xi. 508, 669, t. 15, fig. A-E (1809). *Varneria* L. in Amoen. Acad. iv. 136 (1759), sine descr. *Warneria* L. l.c. 138, sine descr. ; Skeels in U.S. Dept. Agric., Bur. Pl. Industry, Bull. 242, 14 (1912), in obs.

**Gardenia jasminoides** Ellis in Phil. Trans. Roy. Soc. Lond. li. 935, t. 23 (1761); Sol. l.c. lii. 654, t. 20 (1762). *Varneria augusta* L. in Amoen. Acad. iv. 136 (1759), sine descr. *Warneria augusta* L. l.c. 138, sine descr.; Skeels in U.S. Dept. Agric., Bur. Pl. Industry, Bull. 242, 14 (1912). *Gardenia augusta* Merr. Interpr. Rumph. Herb. Amboin. 485 (1917). *Gardenia florida* L. Sp. Pl. ed. 2, 305 (1762), nomen invalidum; Thunb. Diss. Gardenia, 18 (1780); Bot. Reg. t. 449 (1820); Bot. Mag. t. 3349 (1834); Bot. Reg. 1846, t. 43; Franch. et Savat. Enum. Pl. Cap. i. 207 (1875); Forbes et Hemsl. Enum. Fl. China, i. 382 (1888). *Jasminum capense* Mill. Gard. Dict. ed. 8, n. 7 (1768). *Gardenia radicans* Thunb. Diss. Gardenia, 18 (1780); Thunb. Fl. Jap. 109 (1784); Bot. Reg. t. 73 (1815); Andr. Bot. Repos. t. 491. *Catsjopiri* Rumph. Herb. Amboin. vii. 26, t. 14, fig. 2 (1755), status monstrosus. *Jasminum foliis lanceolatis oppositis integerrimis calycibus acutioribus* Mill. Fig. Pl. Gard. Dict. ii. 120, t. 180 (1757); Gard. Dict. ed. 7, n. 7 (1759). *Jasminum? ramo unifloro, pleno, petalis coriaceis* Ehret, Pl. et Pap. rar. t. 15 (1759).

HAB. Native of China and Japan. Widely cultivated in tropical and subtropical countries, and as a conservatory plant in temperate regions.

The attention of botanists is drawn to the case of *Gardenia* and *Warneria* as illustrating a new point in the interpretation of the International Rules of Nomenclature, which may be stated as follows: "*A new name is not validated by the citation of a previous description, unless it is clearly based on that description.*"

#### IV.—TROPICAL AFRICAN PLANTS: VII.\*

J. HUTCHINSON AND J. M. DALZIEL.

##### PAPILIONACEAE (*continued*).

**Indigofera Barteri** Hutch. et J. M. Dalz., sp. nov.; affinis *I. secundiflorae* Poir., sed ramulorum pilis non glandulosis, foliolis minoribus differt.

*Suffrutex*; ramuli pilis brevibus strigillosis hirsuti. *Foliola* circiter 10-juga, oblongo-obovata, apice rotundata et mucronata, basi leviter angustata, 6–8 mm. longa, 3–5 mm. lata, supra puberula, infra strigilloso-pubescentia. *Racemi* pauciflori, foliis breviores; flores secundi, coerulei; pedicelli circiter 2 mm. longi. *Calycis* lobi subulati, 1.25 mm. longi. *Fructus* 5–6 mm. longus, strigilloso-tomentosus.

Nigeria: Northern Provinces; Nupe, in crevices of rocks after rains, *Barter* 951 (type), 1604; Jeba, *Barter*.

**Indigofera djalonica** A. Chev. Explor. Bot. Afr. Occid. Franç. 173, nomen; affinis *I. pilosae* Poir., sed foliolis anguste lanceolatis differt.

\*Continued from *K.B.* 1928, p. 404.

*Frutex* ; rami dense pubescentes. *Foliola* circiter 6-juga, anguste lanceolata, acuta, circiter 2 cm. longa et 0·7 cm. lata, utrinque appresse pilosa ; stipulae lineari-subulatae, 5 mm. longae. *Flores* subumbellato-racemosi, circiter 7 mm. longi ; pedicelli 4–5 mm. longi. *Fructus* linearis, 1·5 cm. longus, glaber.

French Guinea : Futa Jallon, between Dalaba and Diaguissa, 1200–1600 m., Sept., *Chevalier* 18584 (type). Nigeria : Northern Provinces ; Bauchi Plateau, Vom, 1000–1200 m., *Dent Young* 49.

**Eriosema bauchiense** *Hutch. et J. M. Dalz.*, sp. nov. ; valde affinis *E. shirensae* Bak. f. sed foliolis oblongis 2·5–6 cm. longis 1–2·5 cm. latis, stipulis lanceolatis circiter 8 mm. longis longe ciliatis, racemis foliis duplo longioribus pubescentibus, floribus circiter 1 cm. longis fructibus late ellipticis circiter 1·5 cm. longis longe pilosis distincta.

Nigeria : Northern Provinces ; Bauchi Plateau, Vom, 1000–1200 m., *Dent Young* 78 (type) ; 81.

**Eriosema Chevalieri** *Hutch. et J. M. Dalz.*, comb. nov. *Rhynchosia Chevalieri* Harms in Engl. Bot. Jahrb. 40 : 39 (1907) ; Chev. Explor. Bot. Afr. Occid. Franç. 206.

French Sudan : Koundiam, Feb., *Chevalier* 422.

**Erythrina Addisoniae** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *E. altissimae* A. Chev., sed calyce plus minusve regulariter 5-lobato lobis lineari-teretibus, fructibus moniliformibus differt.

*Arbor* circiter 12 m. alta, trunco et ramis aculeis armata. *Foliola* triangulari-ovata, basi latissime cuneata et trinervia, apice sensim et late acuminata, circiter 17 cm. longa et lata, infra molliter pubescentia, nervis lateralibus utrinsecus circiter 8 inter nervos laxae reticulatis. *Calyx* spathaceus, 4 cm. longus, regulariter 5-lobatus, extra molliter tomentosus, lobis linearibus 1·5 cm. longis. *Vexillum* oblongo-ellipticum, circiter 7 cm. longum, minute puberulum. *Fructus* valde moniliformis, glaber, segmentis fere liberis transverse ellipsoideis. *Semina* ellipsoidea, rubra, 1·5 cm. longa, hilo anguste ovato circiter 7 mm. longo.

Sierra Leone : Karene, *Mrs. Addison* (type) ; also in Wando chiefdom and Kamboma, *Mrs. Addison*.

**Vigna multinervis** *Hutch. et J. M. Dalz.*, sp. nov. ; foliolis anguste linearibus nervis lateralibus numerosissimis a costa sub angulo recto abeuntibus distincta.

*Ramuli* gracillimi, glabri. *Foliola* anguste linearia, acuta, basi rotundata, subcordata, 6–10 cm. longa, 5–8 mm. lata, nervis lateralibus numerosissimis reticulatis ; stipulae ovato-lanceolatae, basi rotundatae. *Flores* breviter racemosi ; pedunculi usque ad 2·5 cm. longi. *Calyx* 4 mm. longus, breviter triangulari-lobatus. *Fructus* 6 cm. longus, glaber.

Nigeria : Southern Provinces ; Onitsha, *Barter* 1799 (type). Djur-land : Great Seriba Ghattas, *Schweinfurth* 2578. Uganda : Serere, *Maitland* 1286. Angola : Bembe Mt., *Monteiro*.

**Vigna racemosa** Hutch. et J. M. Dalz., comb. nov. *Clitoria racemosa* G. Don, Gen. Syst. 2 : 215 (1832). *Vigna Donii* Bak. in Oliv. Fl. Trop. Afr. 2 : 202 (1871). *V. nigrizia* Hook. f. Fl. Nig. 310 (1849). *V. luteola* Bak. l.c. 205, non Benth., exd. syn. *V. villosa* Savi.

Extends from Gambia through Nigeria and Angola to Rhodesia.

**Adenodolichos paniculatus** Hutch. et J. M. Dalz., comb. nov. *Dolichos paniculatus* Hua in Bull. Mus. Hist. Nat. Par. 3 : 327 (1897). *D. macrothyrsus* Harms in Engl. Bot. Jahrb. 26 : 320 (1899). *Adenodolichos macrothyrsus* Harms l.c. 33 : 180 (1902).

Extends from French Guinea to the French Cameroons and to the Eastern Sudan.

**Zornia Lelyi** Hutch. et J. M. Dalz., sp. nov. ; a *Z. diphyllae* Pers. frutribus setis gracilibus puberulis longissimis dense obtectis differt.

*Caules* e rhizomate lignoso breves, breviter pubescentes. *Folia* 2-foliolata ; foliola anguste lanceolata, acuta, 3-4 cm. longa, circiter 8 mm. lata, breviter pubescentia sed eglandulosa ; stipulae anguste lanceolatae, appendiculatae, circiter 1.3 cm. longae, nervosae. *Bractae* late ovato-ellipticae, circiter 1 cm. longae, breviter pubescentes. *Flores* non visi. *Fructus* usque ad 3 cm. longus, segmentis setis puberulis circiter 5 mm. longis dense obtectis. *Semina* circiter 5.

Nigeria : Northern Provinces ; Nabardo, 700 m., May, *Lely* 205 (type). Eastern Shari : Ndellé, *Chevalier* 7622.

**Ormocarpum guineense** Hutch. et J. M. Dalz., comb. nov. *Robinia guineensis* Willd. Enum. Hook. Berol. 769 (1809). *O. sennoi* DC. Prod. 2 : 315 (1825) ; Bak. in Oliv. Fl. Trop. Afr. 2 : 143.

Extends from French Guinea through the Eastern tropics to North Australia.

**Desmodium abyssinicum** Hutch. et J. M. Dalz., comb. nov. *Anarthrosyne abyssinica* Hochst. ex Baker in Oliv. Fl. Trop. Afr. 2 : 160, in syn. *D. spirale* Bak. l.c., non DC.

Extends from the Cape Verde Islands to Abyssinia.

**Droogmansia Chevalieri** Hutch. et J. M. Dalz., comb. nov. *Dolichos Chevalieri* Harms in Journ. de Bot. 22 : 114 (1909).

French Guinea : Bilma, Sept., *Chevalier* 19040.

#### MORACEAE.

**Dorstenia obanensis** Hutch. et J. M. Dalz., sp. nov. ; foliis obovatis superne repando-dentatis vel lobulatis, receptaculo breviter ramoso distincta.

*Caules* breviter pubescentes. *Folia* obovata, basi late cuneata, superne repando-dentata, vel lobulata, caudato-acuminata,

12–15 cm. longa, 5–7 cm. lata, glabra, nervis lateralibus utrinsecus circiter 7 utrinque prominulis; petioli circiter 0.5 cm. longi. *Receptacula* supra-axillaria, profunde 6-lobata, usque ad 2.5 cm. expansa, lobis subulato-lanceolatis acutis puberulis.

Nigeria: Southern Provinces; Oban, *Talbot* (Herb. Kew, type); *Talbot* 628, 630.

***Dorstenia Smythi* var. *deltoides* Hutch. et J. M. Dalz.**, var. nov.; a typo foliis apice truncatis et abrupte acuminatis differt.

Ivory Coast: Dyola Country, Danoué, Apr., *Chevalier* 21288 bis.

***Dorstenia piscaria* Hutch. et J. M. Dalz.**, sp. nov.; receptaculo breviter lobulato lobo uno elongatissimo valde distincta.

*Caules* appresse tomentosi. *Folia* late obovata, acute acuminata, basi contracto-cuneata, 15 cm. longa, 6 cm. lata, margine undulata vel lobulata, nervis lateralibus utrinsecus circiter 8; petioli 1.5 cm. longi, hirsuti. *Receptacula* breviter pedunculata, ovato-orbicularia, dentata vel lobulata, circiter 2.5 cm. lata, lobo uno lineare elongato usque ad 7 cm. longo.

Nigeria: Southern Provinces; Oban, *Talbot* (Herb. Kew).

***Ficus djalonensis* A. Chev.** Explor. Bot. Afr. Occid. Franç. 604, nomen; affinis *F. Vogelii* Miq., sed receptaculis majoribus tomentellis differt.

*Folia* elliptica breviter et obtuse acuminata, basi leviter cordata et 5-nervia, circiter 17 cm. longa, 6–10 cm. lata, glabra, nervis lateralibus utrinsecus circiter 8 a costa sub angulo 45° abeuntibus, inter nervos flexuoso-reticulata; petioli circiter 6 cm. longi. Receptacula depresso-globosa, circiter 2 cm. diametro, molliter tomentella, ostiolum bibracteatum.

French Guinea; Futa Jallon, Mamou Circle, near Soya, Jan., *Chevalier* 20372.

#### URTICACEAE.

***Pilea stipulata* Hutch. et J. M. Dalz.**, sp. nov.; affinis *P. cerasomeræ* Wedd., sed foliis haud acuminatis basi rotundatis vel subcordatis, stipulis persistentibus suborbicularibus differt.—*P. cerasomera* Rendle in Prain Fl. Trop. Afr. 6, 2: 269, partim, non Wedd.

*Herba* usque ad 1 m. alta; caules debiles cystolithis crebris notati. *Folia* opposita, leviter anisophylla, late ovata, basi truncata vel subcordata, haud acuminata, usque ad 3 cm. longa et 2.5 cm. lata, crasse dentata, utrinque cystolithis linearibus notata; petioli 1.5–2.5 cm. longi, graciles; stipulae persistentes, suborbiculares, membranaceae, circiter 5 mmi. diametro. *Perianthium* glabrum.

Cameroons Mountain: 2500–2600 m., Dec., *Mann* 2011 (type); *Johnston* 66.

#### HIPPOCRATEACEAE.

***Hippocratea venulosa* Hutch. et M. B. Moss**, sp. nov.; affinis *H. clematoidei* Loes., sed foliis basi rotundatis, floribus minoribus et petalis haud reflexis differt.



*Scandens* ; ramuli glabri, internodiis longis. *Folia* elliptica, basi rotundata, apice abrupte acuminata, 16 cm. longa, 9 cm. lata, crenulata, glabra, chartacea, nervis utrinsecus circiter 10 tertiariis crebre et manifeste reticulatis ; petioli 1 cm. longi. *Inflorescentia* laxa paniculata, terminalis et axillaris. *Sepala* parva, pubescentia. *Petala* lanceolata, circiter 1 cm. longa, extra pubescentia, non reflexa.

Sierra Leone : no locality, *Thomas* 10225, 10550 (type).

**Hippocratea guineensis** *Hutch. et M. B. Moss*, sp. nov. ; affinis *H. apocynoides* Welw., sed ramulis mox glabris, foliis ad nervos et margines glabris, petalis multo brevioribus differt.—*H. apocynoides* Oliv. Fl. Trop. Afr. 1 : 368, partim, non Welw.

*Frutex* scandens 30–40 m. altus ; ramuli pubescentes, demum glabri. *Folia* elliptica, utrinque rotundata, basi inaequilatera, usque ad 15 cm. longa et 7 cm. lata, glabra, nervis lateralibus utrinsecus circiter 7 infra prominentibus ; petioli vix 8 mm. longi. *Inflorescentia* axillaris et terminalis, laxa cymosa, tomentosa ; pedicelli 1 mm. longi. *Flores* parvi, 2 mm. longi, fusci, tomentosi. *Fructus* anguste ellipticus, 5 cm. longus, 2.5 cm. latus, breviter rufo-pubescent.

Common from French Guinea to the Cameroons River and Lagos. —*Chevalier* 14953. *Thomas* 8371. *Johnson* 776. *Dalziel* 204. *Mann* 456, 2218 (type). *Millen* 60.

**Hippocratea Chevalieri** *Hutch. et M. B. Moss*, sp. nov. ; foliis longe acuminatis dentatis marginibus crasse undulatis, floribus breviter cymosis valde distincta.

*Frutex*, ramulis glabris costatis, brunneo-purpureis. *Folia* elliptica, longe acuminata, basi cuneata, glanduloso-serrata, 8 cm. longa, 3 cm. lata, glabra ; petioli vix 1 cm. longi, supra sulcati. *Inflorescentia* axillaris, parva, cymosa ; pedicelli quadrangulares ; bractae lineares, glanduloso-dentatae. *Flores* 5 mm. diametro. *Sepala* ciliata. *Fructus* non visus.

Ivory Coast : Mount Kouan, 400 m., Apr., *Chevalier* 21242.

**Hippocratea Thomasii** *Hutch. et M. B. Moss*, sp. nov. ; affinis *H. Oliverianae* Hutch. et M. B. Moss, sed petalis late ovatis, inflorescentiis tomentosis, pedicellis teretibus differt.

*Scandens*, ramulis mox glabris. *Folia* elliptica, acute triangulari-acuminata, basi late cuneata, glabra, 5 cm. longa, 2.5 cm. lata, nervis inconspicuis ; petioli circiter 5 mm. longi. *Inflorescentia* cymosa, petiolo longior, tomentosa ; pedicelli usque ad 2 mm. longi. *Sepala* minuta, glabra. *Petala* late ovata, glabra, 2 mm. longa. *Fructus* non visus.

Liberia : Gbanga, Sept., *Linder* 699 ; Bonuta, Oct., *Linder* 883. Nigeria : Southern Province ; *Thomas* 1663 (type).

**Hippocratea Oliveriana** *Hutch. et M. B. Moss*, sp. nov. ; affinis *H. pallenti* Planch., sed inflorescentiis petiolis longioribus multifloris

satis distincta.—*H. pallens* Oliv. Fl. Trop. Afr. 1 : 367, partim, non Planch.

*Frutex* scandens, ramulis glabris. *Folia* obovato-elliptica, apice abrupte acuminata, basi cuneata, glabra, 7 cm. longa, 4 cm. lata, nervis lateralibus utrinsecus 4; petioli usque ad 1 cm. longi. *Inflor-escentia* cymosa, axillaris, usque ad 3.5 cm. longa, glabra, bracteis conspicuis; pedicelli quadrangulares. *Flores* parvi, flavo-virides. *Petala* spathulata. *Fructus* late obovatus, ligneus, 3 cm. longus, glaber.

Sierra Leone: Bagroo River, *Mann* 855 (type); Dantilia, Mar., *Scott Elliot* 5270. Liberia: Monrovia, *Whyte*. Gold Coast: E. Akim, June, *Johnson* 760. Togo: Lome, *Warnecke* 157, 302. Nigeria: Southern Province, Oban District, *Talbot* 1447. Gabon: Nyanga, *Le Testu* 1928. Angola: Cazengo; between Luinha and Palmira, Jan., *Welwitsch* 1336.

**Hippocratea Loesneriana** *Hutch. et M. B. Moss*, sp. nov.; affinis *H. Oliverianae* Hutch. et M. B. Moss, sed fructibus multo longioribus quam latis emarginatis, inflorescentiis foliis aequilongis vel longioribus differt.—*H. indica* Oliv. Fl. Trop. Afr. 1 : 368, non Willd.

*Frutex* 30–40 m. altus, ramulis glabris. *Folia* elliptica vel ovata, utrinque angustata, glabra, inconspicue serrata, 9 cm. longa, 4 cm. lata, nervis lateralibus utrinsecus circiter 5; petioli usque ad 1 cm. longi, supra sulcati. *Inflorescentia* laxa cymosa, glabra; bractee conspicuae. *Flores* multi et parvi. *Fructus* anguste oblongus, apice emarginatus, ligneus, 5 cm. longus, 1 cm. latus.

French Guinea: Futa Jallon, Apr., *Caille in Herb. Chevalier* 18145; *Chevalier* 18618. Sierra Leone: various localities, *Thomas* 3702; *Scott Elliot* 4456; *Lane-Poole* 48 (type). Liberia: Gbanga, Sept., *Linder* 490, 808; Du River, Aug., *Linder* 283. Ivory Coast: Mt. Kouan, *Chevalier* 21243. Gold Coast: *Irvine* 385. Nigeria: Northern Province, Nupe, *Barter*; Southern Province, Lagos, Jan., *Millen* 110. Fernando Po, *Mann* 185. Angola: various localities, *Welwitsch* 1324, 1333, 1334, 1337, 1338.

**Salacia euryoides** *Hutch. et M. B. Moss*, sp. nov.; affinis *S. macrocarpae* Welw., sed pedicellis brevioribus, alabastris longioribus et angustioribus, foliis brevissime acuminatis differt.—*S. macrocarpa* var. *grandiflora* Loes.

*Frutex*, ramulis sulcatis glabris. *Folia* late elliptica, apice breviter acuminata, basi breviter cuneata, glabra, circiter 12 cm. longa, 4–6 cm. lata, crenata, nervis lateralibus utrinsecus 8, tertiariis manifeste reticulatis; petioli usque ad 1 cm. longi, glabri. *Inflorescentia* fasciculata, axillaris, multiflora; pedicelli usque ad 1.5 cm. longi. *Alabastra* elongata, dimidio longiora quam lata. *Sepala* late ovata, fimbriata, mox glabra. *Petala* obovata, 5 mm. longa, flava. *Fructus* non visus.

Sierra Leone: Talla Hills, Feb., *Scott Elliot* 4870 (type); Berria, Mar., *Scott Elliot* 5433.

**Salacia Dalzielii** Hutch. et M. B. Moss, sp. nov. ; affinis *S. macrocarpae* Welw., sed foliis obovato-oblongis utrinque angustatis undulatis pedicellis brevioribus differt.

*Frutex* scandens, ramulis annotinis scabridis hornotinis glabris. *Folia* obovato-oblonga, utrinque angustata, undulata et crenata, circiter 8 cm. longa, 3·5 cm. lata, nervis lateralibus utrinsecus 9, tertiariis reticulatis ; petioli 6 mm. longi. *Inflorescentia* axillaris, fasciculata, multiflora ; pedicelli circiter 1 cm. longi. *Alabastra* elongata, dimidio longiora quam lata. *Sepala* late ovata, fimbriata. *Petala* lanceolata, 4 mm. longa.

Nigeria : Northern Province, Lokoja, Feb., *Dalziel* 92 (type) ; Southern Province, Ezi, Feb., *Thomas* 2328, 2358.

**Salacia leonensis** Hutch. et M. B. Moss, sp. nov., affinis *S. bipindensi* Loes., sed foliis symmetrico-acuminatis basi sub-cordatis, petiolis brevioribus differt.

*Frutex*, ramulis quadrangularibus crebre verrucosis. *Folia* leviter obovato-elliptica, apice acuminata, basi subcordata, glabra, parce crenata, usque ad 15 cm. longa, 5 cm. lata, nervis lateralibus utrinsecus 4, costa media supra prominente ; petioli usque ad 5 mm. longi, supra sulcati, rugosi. *Inflorescentia* pedunculata, glomerata ; pedunculus vix 1 cm. longus ; pedicelli circiter 6 mm. longi. *Flores* 6 mm. diametro. *Fructus* ovoideus, longe acuminatus, 4–6 cm. longus, 2·5 cm. latus, manifeste verrucosus et rugosus.

Sierra Leone : various localities, *Unwin & Smythe* 16 ; *Aylmer* 82 ; *Thomas* 7650 b, 7944 (type), 9360. Liberia : Peahtah, *Linder* 906.

**Salacia Caillei** Hutch. et M. B. Moss, sp. nov. ; affinis *S. nitidae* N.E. Br., sed foliis minoribus abrupte acuminatis, pedunculo commune longiore differt.

*Frutex* ramulis teretibus glabris. *Folia* elliptica vel leviter obovata, abruptissime acuminata, apice rotundata, basi gradatim cuneata, glabra, 6·5–9 cm. longa, 2·5–4 cm. lata, nervis lateralibus utrinsecus 8 inconspicuis ; petioli 5 mm. longi, rugosi. *Inflorescentia* pedunculata, glomerata, pedunculus communis usque ad 8 mm. longus ; pedicelli breves. *Flores* parvi. *Fructus* late obovoideus, basi valde abrupte angustatus, 2 cm. longus, 1·5 cm. latus.

French Guinea : Kouria, Sept., *Chevalier* 14902. Sierra Leone ; various localities, July, *Thomas* 1071 ; Oct., *Thomas* 3450 (type), 3730, 9016. Liberia : Banga, *Linder* 1241. Gold Coast : Kloba, July, *Johnson* 1107.

**Salacia Howesii** Hutch. et M. B. Moss, sp. nov. ; affinis *S. nitidae* N.E. Br., sed cymis fasciculatis, foliis oblanceolato-obovatis sub-abrupte et obtuse acuminatis, sepalis petalisque puberulis differt.

*Frutex* parvus, ramulis lignosis. *Folia* oblanceolato-obovata, subabrupte et obtuse acuminata, basi gradatim cuneata, circiter

15 cm. longa, 5–6 cm. lata, apicem versus minute denticulata, nervis lateralibus utrinsecus circiter 7; petioli usque ad 6 mm. longi, glabri, rugosi. *Inflorescentia* axillaris, cymosa, pedunculata, fasciculata; pedunculi et petioli puberuli. *Flores* virides, 4 mm. diametro. *Sepala* et *petala* extra puberula.

Gold Coast: Anaje, 7 miles north-west of Sekondi, Oct., *Howes* 974.

#### ICACINACEAE.

**Pyrenacantha Staudtii** *Hutch. et J. M. Dalz.*, comb. nov. *Chlamydocarya Staudtii* Engl. Bot. Jahrb. 24: 486 t. 8 A-D (1897).

Extends from Southern Nigeria to the Belgian Congo.

**Chlamydocarya macrocarpa** *A. Chev.* Explor. Bot. Afr. Occid. Franç. 128, nomen; species fructibus corollis persistentibus elongatis 4 cm. longis coronatis valde distincta.

*Folia* elliptica, late acuminata et mucronata, basi anguste rotundata, circiter 16 cm. longa et 7 cm. lata, integra, infra laxe reticulata, nervis lateralibus utrinsecus 8–10 marginem versus multe ramosis; petioli 2.5 cm. longi, glabri. *Flores* non visi. *Fructus* turbinatus, 2.5 cm. longus, superne villosus, corolla persistente elongata 4 cm. longa extra setosa coronatus.

Ivory Coast: Dabou, *Chevalier* 17216.

**Iodes Talbotii** *Bak. f. ex Hutch. et J. M. Dalz.*, sp. nov.; ramulis pilis debilibus hirsutis foliis basi cordatis valde distincta.

*Scandens*; ramuli longe pilosi et breviter tomentelli. *Folia* ovata, breviter acuminata, basi cordata, 5–9 cm. longa, 3–5 cm. lata, infra pilosa, nervis lateralibus utrinsecus 6; petioli vix 1 cm. longi; cirrhi extra-axillares, usque ad 15 cm. longi. *Cymae* axillares, breves, pauciflorae, ubique piloso-tomentosae. *Ovarium* dense tomentosum. *Fructus* late ellipsoideus, 1.3 cm. longus, crasse reticulatus et tomentellus.

Nigeria: Southern Provinces; Oban, *Talbot* 572.

**Raphiostylis cordifolia** *Hutch. et J. M. Dalz.*, sp. nov.; foliis ovato-ellipticis longe acuminatis basi cordatis valde distincta.

*Frutex* scandens; ramuli dense pilosi. *Folia* ovato-elliptica, basi cordata, apice longe et obtuse acuminata, 9–12 cm. longa, 5–6 cm. lata, infra nervis praesertim pilosa, nervis lateralibus utrinsecus 3–4 arcuatis; petioli 3–4 mm. longi, villosi. *Flores* axillares, glomerati, sessiles. *Sepala* apicem versus setulosa. *Petala* linearilanceolata, 8 mm. longa, apice leviter setuloso excepto glabra. *Ovarium* villosum.

Liberia: Banga, Oct., *Linder* 1218.

#### OPILIACEAE.

**Urobotrya Stapfiana** *Hutch. et J. M. Dalz.*, sp. nov.; affinis *U. angustifoliae* Stapf, sed foliis ellipticis vel ovato-ellipticis latioribus differt.

*Ramuli* glabri : *Folia* oblongo-elliptica, acuta, acuminata, basi rotundata, circiter 14 cm. longa et 5 cm. lata, glabra, nervis lateralibus utrinsecus 6 infra prominulis ; petioli usque ad 1 cm. longi. *Racemi* 15 cm. longi, penduli, glabri ; pedicelli 1.3 cm. longi, graciles. *Sepala* 3 mm. longa. *Stamina* longe exserta.

Sierra Leone : Bafi River, Feb., *Macdonald* 6. Liberia : Kakatown, *Whyte* (type) ; St. Paul's River, *Reynolds*.

#### OCTOKNEMATACEAE.

**Octoknema borealis** *Hutch. et J. M. Dalz.*, sp. nov. *O. affinis* A. Chev. Explor. Bot. Afr. Occid. Franc. 125, non Pierre.

*Frutex* ; ramuli stellato-puberuli. *Folia* oblongo-obovata, acuminata, basi breviter cuneata, 15–25 cm. longa, 5–8 cm. lata, infra costa et costam versus stellato-puberula, nervis lateralibus utrinsecus 6–7 intra marginem evanidis ; petioli stellato-tomentelli, 2.5–3 cm. longi, apicem versus incrassati. *Racemi* axillares vel leviter supra-axillares, circiter 5–6 cm. longi, pilis brevibus stellatis ubique induti ; pedicelli 1–2 mm. longi. *Alabastra* globosa minima. *Fructus* inferior, subglobosus, circiter 1 cm. longus, calycis lobis persistentibus latis coronatus.

French Guinea : Kouria, *Chevalier* 18183. Kissidougou, Feb., *Chevalier* 20707. Sierra Leone : North Kundita, Mar., *Scott Elliot* 5042 (type). Ivory Coast : Alépé, Mar., *Chevalier* 16246 ; Upper Cavally, near Ona, Apr., *Chevalier* 21318, 21321.

#### RUTACEAE.

**Fagara Unwinii** *Hutch. et J. M. Dalz.*, sp. nov. ; foliolis oblongo-lanceolatis breviter acuminatis, fructibus globosis rugosis distincta.

*Rami* leviter aculeati, glabri. *Folia* usque ad 18 cm. longa. *Foliola* oblongo-lanceolata, breviter acuminata, basi inaequaliter cuneata, 6–7 cm. longa, circiter 2 cm. lata, nervis lateralibus numerosis patulis. *Flores* non visi. *Infructescentia* paniculata, circiter 12 cm. longa. *Fructus* globosus, rugosus, circiter 5 mm. diametro. *Semina* nigra, nitida, globosa.

Nigeria : Southern Provinces ; Boji Hills, 1500 m., *Unwin* 13.

**Fagara attiensis** *Hutch. et J. M. Dalz.*, sp. nov. ; foliolis plus minusve oblongo-ellipticis subcaudato-acuminatis parce glanduloso-punctatis, fructibus laevibus distincta.

*Frutex* vel arbor parva ; ramuli verruculosi, aculeati. *Foliola* multijuga, opposita, oblongo-elliptica, subcaudato-acuminata, basi breviter cuneata, 8–12 cm. longa, 2.5–6 cm. lata, parce glanduloso-punctata, crenulata, nervis lateralibus utrinsecus circiter 10 arcuatis intermediis plus minusve reticulatis. *Paniculae* usque ad 15 cm. longae, glabrae ; pedicelli 1.5 mm. longi. *Sepala* oblonga, 2.5 mm. longa. *Fructus* oblique globosus, circiter 7 mm. diametro, glaber.

Sierra Leone : without locality, *Scott Elliot* 5745. Ivory Coast : Alépé, *Chevalier* 17423 (type) ; Morenou, *Chevalier* 22471. Gold Coast : Okroase, May, *Johnson* 750. Nigeria : Southern Provinces ; without locality, *Thomas* 1797.

#### BURSERACEAE.

**Commiphora Dalzielii** *Hutch.*, sp. nov. ; valde affinis *C. africanae* Engl., sed foliolis infra glabris obscure crenatis obovato-rhomboideis 2·5–4 cm. longis 1·5–3 cm. latis tenuissimis, petiolo foliolis longiore, ramulis saepe spinescentibus (floribus non visis), fructibus carnosis ellipsoideo-globosis 1 cm. longis differt.

Gold Coast : Winnebah Plain, fr. Feb., Dalziel 8296.

#### MELIACEAE.

**Guarea leonensis** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *G. glomerulatae* Harms, sed petalis margine excepto glabris, foliolis circiter 3-jugis differt.

*Arbor* vel frutex ; ramuli purpurascens, glabri. *Foliola* circiter 3-juga, elliptica, longe acuminata, basi breviter cuneata, 7–10 cm. longa, circiter 3·5 cm. lata, nervis lateralibus obscuris circiter 5-jugis. *Flores* laxissime paniculati ; paniculae foliis breviores, puberulae, pedicelli 2–3 mm. longi. *Calyx* cupularis, 2 mm. longus, undulate dentatus, extra glaber. *Petala* linear-oblonga, 0·8 cm. longa, margine puberula. *Ovarium* glabrum. *Fructus* non visus.

Sierra Leone : Gola Forest, Jan., *Unwin & Smythe* 39 ; Koteimahun, *Lane-Poole* 337 (type).

**Turraeanthus Vignei** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *T. Zenkeri* Harms, sed foliolis longe acuminatis latioribus differt.

*Arbor* ; ramuli puberuli. *Foliola* numerosa, alterna, elongato-oblonga vel subelliptica, longe acuminata, basi rotundata vel breviter cuneata, 15–25 cm. longa, 5–8 cm. lata, tenuiter chartacea, infra glabra, nervis lateralibus utrinsecus circiter 20 a costa subangulo fere recto abeuntibus. *Paniculae* breves, tomentellae. *Flores* flavi, angusti, cylindrici, circiter 2 cm. longi. *Calyx* cupularis, truncatus vel undulatus. *Corolla* 1·5 cm. longa, extra tomentosa. *Columna* staminalis breviter exserta.

Gold Coast : Nfoum, Cape Coast district, Apr.-June, *Vigne* 948.

#### SAPINDACEAE.

**Allophylus megaphylla** *Hutch. et J. M. Dalz.*, sp. nov. ; foliola magna circiter 45 cm. longa et 15 cm. lata valde distincta.

*Ramuli* appresse pubescentes. *Foliola* magna, obovata, basi cuneata, longe acuminata, usque ad 45 cm. longa et 15 cm. lata, denticulata, infra fere glabra, nervis lateralibus utrinsecus circiter 12 inter nervos laxae reticulata ; petioli pubescentes. *Paniculae*

angustae, ramulis brevissimis, ubique parce pubescentes ; pedicelli 3 mm. longi. *Alabastra* late ovoidea, minute puberula.

Nigeria : Southern Provinces ; Oban, *Talbot* 414, 1393 (type).

**Laccodiscus cauliflorus** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *L. ferrugineo* Radlk., sed foliolis integris basi rotundatis infra setoso-pubescentibus differt.

*Arbor* parva ; ramuli graciles, hirsuti. *Foliola* opposita, late oblongo-elliptica, basi rotundata, apice abruptissime et anguste triangulari-acuminata, 8–20 cm. longa, 5–8 cm. lata, integra, infra praesertim nervis longe setoso-pilosa, nervis lateralibus circiter 8–10. *Paniculae* et trunco ortae, dense hirsutae, usque ad 20 cm. longae. *Alabastra* subglobosa. *Sepala* 4, valvata, hirsuta. *Petala* 4, intra saccata. *Stamina* 7, filamentis et antheris pubescentibus.

Gold Coast : Amaneakrom, Sept., *Chipp* 372.

**Aphania silvatica** *A. Chev.* Explor. Bot. Afr. Occid. Franç, 152, nomen ; affinis *A. senegalensi* Radlk., sed foliolis elongato-oblongis late acuminatis longe petiolatis differt.

*Arbor* parva. *Foliola* 2-juga, elongato-oblonga, apice late acuminata, basi anguste cuneata, 12–20 cm. longa, 3–8 cm. lata, glabra, utrinque venuloso-reticulata, nervis lateralibus multe ramosis. *Paniculae* e basi ramosae, usque ad 18 cm. longae, breviter pubescentes. *Flores* conferti ; pedicelli medio articulati, pubescentes. *Sepala* orbicularia, ciliata. *Stamina* basi villosa. *Ovarium* didymum, glabrum, carpella una abortiva. *Fructus* late ellipsoideus, 1.3 cm. longus, glaber.

Ivory Coast : Cavally Basin, *Chevalier* 20064 (type). Gold Coast : Tano River, Sept., *Chipp* 345.

**Chytranthus atrovioleaceus** *Bak. f. ex Hutch. et J. M. Dalz.*, sp. nov. ; racemis elongatis purpurascens, foliolis magnis distincta.

*Arbor* usque ad 20 m. alta. *Foliola* elongato-oblonga vel oblongo-elliptica, abrupte caudato-acuminata, basi breviter cuneata, 30–35 cm. longa, 9–15 cm. lata, nervis lateralibus prominentibus utrinsecus circiter 25, inter nervos reticulata, supra nitida. *Racemi* e trunco glomerati, elongati, purpurascens. *Calyx* campanulatus, 1 cm. longus, fere ad medium lobatus, extra tomentellus, atrovioleaceus. *Petala* obovato-spathulata, calyce paulo longiora, puberula. *Ovarium* et stylus purpureis setosus.

Sierra Leone : near Heirakohun, *Smythe* 126. Nigeria : Southern Provinces ; Oban, *Talbot* 1583, 1596 (type).

**Chytranthus ellipticus** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *C. setoso* Radlk., sed foliolis basi rotundatis vel subcordatus ellipticis differt.

*Ramuli* tomentelli. *Foliola* oblongo-elliptica, acute acuminata, basi rotundata vel subcordata, 20–25 cm. longa, 8–10 cm. lata, costa et nervis lateralibus utrinsecus circiter 14 dense et longe

pilosis, subbullata ; petioluli circiter 5 mm. longi, hirsuti. *Racemi* conferti, juniores densissime floriferi, demum usque ad 15 cm. longi, ubique molliter tomentosi. *Bractee* breviter triangulari-subulatae, tomentosae, 2 mm. longae. *Alabastra* pyramidata, circiter 5 mm. longa.

Nigeria : Southern Provinces ; Oban, *Talbot* 1399 ; Eket, *Talbot* 3129 (type).

**Pancovia sessiliflora** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *P. pedicellari* Radlk. et Gilg, sed floribus glomeratis sessilibus, foliolis 1-2-jugis differt.

*Frutex* scandens ; ramuli glabri. *Foliola* 1-2-juga, opposita, obovata-elliptica, obtuse acuminata, basi cuneata, 8-16 cm. longa, 4-7 cm. lata, utrinque crebre reticulata, glabra, nervis lateralibus utrinsecus circiter 10 ; petioluli 5-6 mm. longi. *Flores* glomerati, sessiles. *Calyx* cupularis, 4 mm. longus, lobis ovatis obtusis, extra tomentellis. *Petala* obovata, margine crispata.

Nigeria : Southern Provinces ; Ikoyi Plains, Lagos, Feb., *Dalziel* 1178.

#### MELIANTHACEAE.

**Bersama subalata** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *B. leiostegiae* Stapf, sed stipulis appresse villosis lanceolato-triangularibus minoribus differt.

*Ramuli* crassi fere glabri. *Folia* usque ad 35 cm. longa ; rhachis superne anguste alatus ; foliola circiter 7-juga, oblongo-elliptica, obtuse acuminata, 6-12 cm. longa, 3-4.5 cm. lata, integra, nervis lateralibus circiter 8 infra puberulis exceptis glabra ; stipulae lanceolato-triangulares, circiter 1.3 cm. longae, appresse villosae. *Inflorescentia* non visa ; pedicelli 5-7 mm. longi, molliter tomentelli. *Sepala* triangulari-ovata, 5 mm. longa, tomentella. *Petala* mox reflexa, oblongo-oblancheolata, 1 cm. longa, utrinque tomentella.

Nigeria : Southern Provinces, Oban, *Talbot* 147.

#### ANACARDIACEAE.

**Sorindeia deliciosa** *A. Chev.* Explor. Bot. Afr. Occid. Franç. 160, nomen ; species non satis nota foliolis oblongo-ellipticis longe et subcaudato-acuminata distincta.

*Ramuli* crassi, glabri. *Folia* usque ad 35 cm. longa ; foliola circiter 8-juga, subopposita, oblongo-elliptica, longe et subcaudato-acuminata, basi inaequilatere cuneata, circiter 15 cm. longa et 6 cm. lata, glabra, nervis lateralibus utrinsecus 8-9 infra prominentibus conjunctis ; petioluli 1 cm. longi, transverse verrucosi. *Flores* non visi. *Fructus* oblongo-ellipsoideus, 3 cm. longus, sicco verruculosus, exocarpeo lignoso 2 mm. lato, endocarpeo membranaceo stramineo.

Ivory Coast : various localities, *Chevalier* 16170, 16819, 16982 bis, 17010, 17011, 22314, 22683 (type). Nigeria : Southern Provinces ; without locality, *Thompson* 9.



**Trichoscypha Smythi** *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *T. ferrugineae* Engl., sed inflorescentia elongata dense pilosa differt.

*Foliola* 6-juga, oblonga, sensim acuminata, basi breviter cuneata, circiter 20 cm. longa et 6 cm. lata, supra costa densissime villosa, infra leviter pubescentia, nervis lateralibus numerosis ; petioluli 1 cm. longi. *Inflorescentia* elongata, pauciramosa, dense pilosa. *Flores* conferti, glabri ; pedicelli usque ad 2 mm. longi. *Petala* ovata, 2 mm. longa.

Sierra Leone : Picket Hill, Dec., *Unwin & Smythe* 33.

**Rhus incana** var. **dahomensis** *Hutch. et J. M. Dalz.*, var. nov. ; a typo foliis apice late rotundatis vel emarginatis superne crenulatis infra tenuiter pubescentibus differt.

Dahomey : between Kouandé and Konkobiri, *Chevalier* 24263.

#### ARALIACEAE.

**Polyscias fulva** *Hutch. et J. M. Dalz.*, comb. nov. ; *Panax fulvum* Hiern in Oliv. Fl. Trop. Afr. 3 : 28.

Extends from the Island of Fernando Po through the French Cameroons to Uganda.

**Cussonia longissima** *Hutch. et J. M. Dalz.*, sp. nov. ; foliolis oblongo-obovatis abruptissime acuminatis subintegris vel crenulatis graciliter venulosis distincta.

*Arbor* parva ; ramuli crassi. *Foliola* oblongo-obovata, abrupte acuminata, basi longe cuneata, circiter 15 cm. longa et 6 cm. lata, subintegra vel crenulata, infra crebre venulosa, nervis lateralibus utrinsecus 10–12 gracilibus. *Spicae* floriferae circiter 15 cm. longae, demum elongatae ; bractae parvae, reflexae. *Fructus* junior obovoideus, 5 mm. longus.

Gold Coast : Salaga, June, *Saunders in Herb. Chipp.* 805 (type) ; without locality, *Thompson* 61.

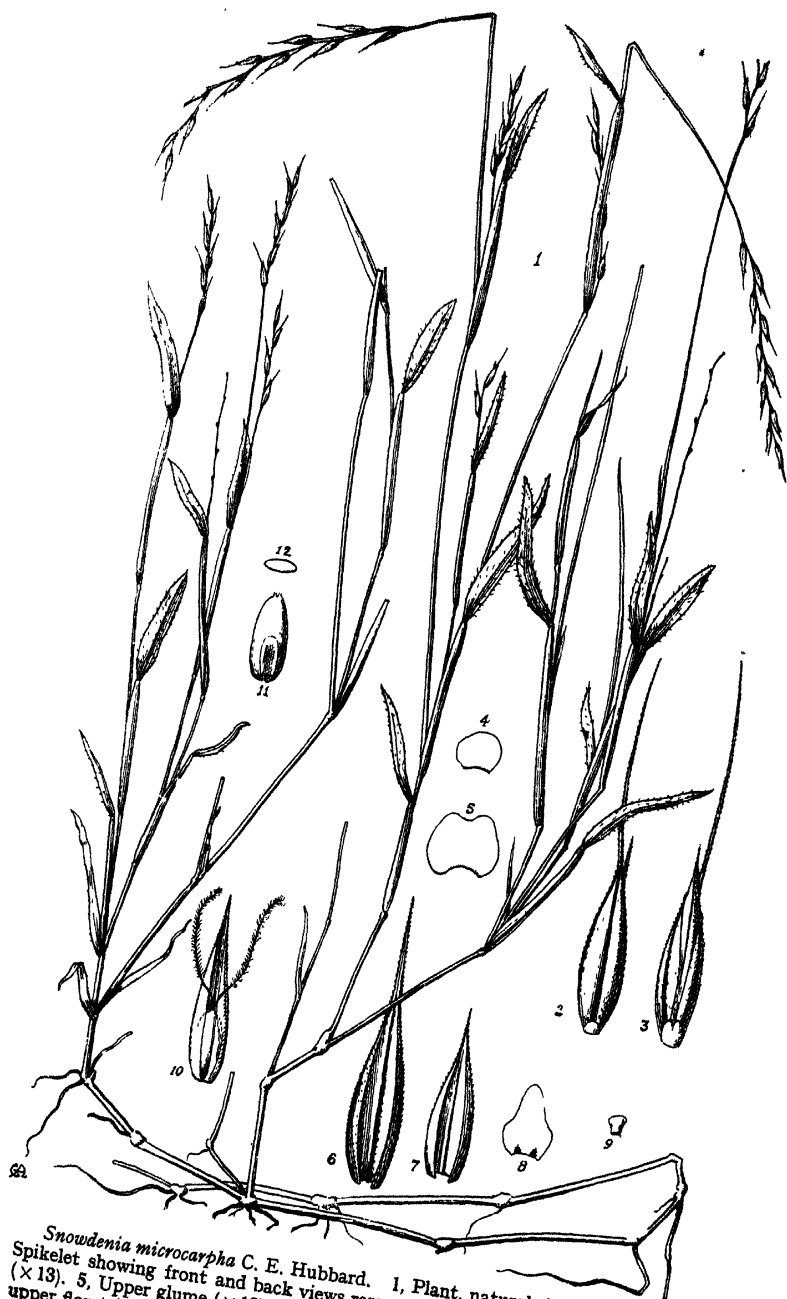
### V.—NOTES ON AFRICAN GRASSES, VIII.

#### SNOWDENIA, A NEW GENUS FROM UGANDA.

C. E. HUBBARD.

Whilst on tour in the Mount Elgon area of the Bugishu district of Uganda, Mr. J. D. Snowden made an extensive collection of the grasses growing on the upper slopes of the Butandiga ridge. Amongst several of exceptional interest is the subject of the present paper, which is described below as a new genus. It has been named *Snowdenia* after its discoverer, who, during 17 years service in the Agricultural Department of Uganda, has studied the flora with enthusiasm and discovered many additions and novelties.

The new grass was found growing in short grass turf, on land much frequented by cattle, sheep and goats, near the edge of bushes, in association with such grasses as *Digitaria abyssinica* Stapf, *D.*



*Snowdenia microcarpha* C. E. Hubbard. 1, Plant, natural size. 2 and 3, Spikelet showing front and back views respectively ( $\times 13$ ). 4, Lower glume ( $\times 7$ ). 5, Upper glume ( $\times 13$ ). 6, Lemma of lower floret ( $\times 7$ ). 7, Lemma of upper floret ( $\times 7$ ). 8, Palea ( $\times 7$ ). 9, Lodicule ( $\times 7$ ). 10, Upper floret ( $\times 7$ ). 11, Caryopsis ( $\times 7$ ). 12, Section of caryopsis ( $\times 7$ ).

*scalarum* Chiov., *Panicum calvum* Stapf, *Oplismenus hirtellus* P. Beauv., *Arthraxon Quartinianus* Nash, *Acritochaete Volkensii* Pilger, *Pennisetum clandestinum* Hochst., etc.

The only genus with which it shows any marked affinity is *Acritochaete* Pilger, which was originally described from specimens collected on Kilimanjaro by Volkens, but is now known to occur on Mount Aberdare in Kenya Colony and on Mount Elgon in Uganda. *Snowdenia* is a short grass with weak, decumbent, much-branched culms, rooting at the lower nodes and with all the branches bearing solitary, slender, spiciform racemes. It differs from *Acritochaete*, first in regard to the arrangement of its inflorescence, and secondly in the structure of its spikelets. On first examination the spikelets appear to be spirally arranged, but this is due to the twisting of the raceme-axis; they are really subsecund and distichous. The peduncles of the racemes may be solitary, but more often there are two or three together from the uppermost node, whereas in *Acritochaete* the peduncles are always solitary and bear from one to three racemes. The new genus has the spikelets rather more dorsally compressed, quite glabrous and shortly awned, but they are similar in outline to those of *Acritochaete*, although slightly smaller. The lower glumes are very similar in both genera; the upper glumes are, however, very different. In *Snowdenia* the upper glume is reduced to a very small nerveless hyaline scale resembling the lower, whereas in *Acritochaete* it is lanceolate in outline, almost as long as the spikelet, prominently three-nerved, firm in texture and produced at the tip into a long, very fine, twisted awn. The lemma of the lower floret is more flattened on the back than in Pilger's genus, whilst in the dry state only three of the five nerves can be distinctly seen. The lemma of the upper floret bears a close resemblance to that of *Acritochaete*; it is thinly chartaceous and has thin membranaceous margins which just touch, folding loosely over the palea. The palea of the upper floret is very much reduced and only about half the length of the floret. It has broad flaps at the base, is very thinly membranous or almost hyaline in texture, keelless and nerveless and loosely envelops the caryopsis which is more or less exposed at the tip.

*Snowdenia* is also allied to *Chloridion* Stapf, but the digitate inflorescence and very much reduced spikelets of the latter at once distinguish it.

***Snowdenia* C. E. Hubbard**, gen. nov.; affinis *Acritochaetae* Pilger, sed racemis solitariis, pedunculis racemorum plerumque binatis vel trinatis, spiculis breviter aristatis, gluma superiore minuta hyalina enervia, palea anthoecii superi enervia hyalina multo brevior differt.

*Spiculae* lanceolatae vel lineari-lanceolatae, tenuiter acutae et breviter aristatae, dorso compressae, cum pedicello articulatae, laxe imbricatae, alternatae, biseriatae, subsecundae in rhachi

spiciformis racemi. *Anthoecia* bina; inferum sterile, lemmati reductum; superum ♀. *Glumae* minutae, hyalinae, albae, enerviae, exaristatae; inferior abaxialis, leviter superiore brevior. *Anthoecium inferum*: lemma spiculae aequilongum, ambitu lanceolatum, dorso planum, apice aristatum, tenuiter chartaceum, 5-nervium, nervis scabridulis prominentibus. *Anthoecium superum*: lemma infero simile sed leviter brevius, 3-5-nervium, tenuiter chartaceum, marginibus membranaceis; palea squamae brevi hyalinae enerviae reducta. *Lodiculae* binae, minutae, cuneatae, truncatae, glabrae. *Stamina* 3. *Ovarium* oblongo-ovoideum; styli terminales, distincti; stigmata lateraliter exserta. *Caryopsis* oblonga, dorso compressa, inter lemma paleamque laxe inclusa, hilo basali, scutello dimidium caryopsidis aequante.—*Gramen* annuum, culmis debilibus, multiramosis; foliorum laminae lanceolatae, oblongo-lanceolatae, vel lineari-lanceolatae; ligulae membranaceae, ciliolatae, truncatae; racemi graciles, solitarii, pedunculi racemorum raro solitarii, plerumque binati vel trinati.

***Snowdenia microcarpha* C. E. Hubbard.** Culmi longe decumbentes et geniculato-ascendentes, e nodis radicales, multiramosi, omnibus ramis floriferis, 15-30 cm. alti, graciles vel gracillimi, teretes, virides vel purpurei, multinodi, laeves vel leviter asperuli, nodis pubescentibus pilis albis retrorsis adpressis, ceterum glabri. *Foliorum vaginae* moderate laxae, tenues, tenuiter striatae, glabrae laevesque vel superne molliter pubescentes, marginibus plerumque ciliatis; ligulae 1 mm. longae; laminae basi angustatae, breviter acutae vel raro obtusae, 1.2-3 cm. longae, 2.5-5 mm. latae, planae, tenues, glabrae laevesque vel sparse pubescentes tuberculataeque. *Racemi* graciles, flexuosi vel stricti, 2.5-4 cm. longi; rhachis gracillima, ad 0.25 mm. lata, glabra, valde flexuosa, laevis vel minute asperula; pedicelli ad 0.5 mm. longi, apice leviter incrassati, minute puberuli. *Spiculae* 3.5-4 mm. longae, glabrae, virides. *Gluma* inferior lata, 0.4 mm. longa; superior late ovata, biloba vel truncata, 0.7 mm. longa. *Lemma anthoecii inferi* asperulum, arista tenuissima 3-5 mm. longa. *Lemma anthoecii superi* 3 mm. longum, arista circ. 1 mm. longa; palea oblonga, obtusa, 1.8 mm. longa. *Antherae* 1 mm. longae. *Caryopsis* 1.5-2 mm. longa, pallide fusca.

UGANDA. Mt. Elgon: Butandiga, 2100 m., Dec. 1927, Snowden 1228.

## VI.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—

Mr. G. F. CLAY, M.C., B.Sc. (Geneticist, Amani Institute), to be Senior Agricultural Officer, Uganda (*K.B.* 1927, p. 315); Mr. D. THORNTON, D.Sc., Mr. F. E. BUCKLEY, A.R.C.S., Mr. K. D. R. DAVIS, B.A., Mr. C. B. TAYLOR, Superintendents, Agricultural Department, Nigeria; Mr. T. H. NICOL, B.Sc., Agricultural Instructor, Sultan Idris College, Federated Malay States; Mr. J. L. GREIG, B.Sc.,

Assistant Agriculturist, Federated Malay States ; Mr. E. J. H. CORNER, B.A., Assistant Director of Gardens, Straits Settlements ; Mr. H. A. PIERIS, Divisional Agricultural Officer, Ceylon ; Mr. R. H. COWAN, Produce Inspector, Nigeria ; Mr. R. M. MAYNARD, B.Sc., District Agricultural Officer, Tanganyika Territory ; Mr. H. B. WATERS, B.A. (Deputy Assistant Director of Agriculture, Nigeria), Deputy Director of Agriculture, Gold Coast (*K.B.* 1921, p. 171).

Mr. F. A. STOCKDALE, C.B.E., Director of Agriculture, Ceylon, has been appointed Assistant Agricultural Adviser to the Secretary of State for the Colonies (*K.B.* 1916, p. 277).

The following appointments at the Royal Botanic Gardens, Kew, have been made by the Minister of Agriculture and Fisheries :—

Miss M. L. GREEN, B.A., F.L.S., to be an Assistant in the Herbarium, on the re-grading of her post as Sub-Assistant for the Index Kewensis.

Mr. E. M. MARSDEN-JONES, F.L.S., to be an Honorary Associate for Transplant and Breeding Experiments.

Sir WILLIAM TURNER THISELTON-DYER, K.C.M.G., C.I.E. We record with deep regret the death, on Christmas Eve, 1928, of Sir William Thiselton-Dyer, the third Director of the Royal Botanic Gardens, in his 86th year.

Sir William was appointed Assistant Director to Sir Joseph Hooker in 1875, and ten years later he succeeded to the Directorship on the resignation of Sir Joseph. For the next twenty years his remarkable administrative powers were devoted to the development of the Gardens as the centre of Botanical Enterprise for the Empire, and also as a place of beauty and scientific interest and education for the public generally.

It is hoped to publish a fuller appreciation of Sir William's work in a future number of the Bulletin.

The VEN. WILLIAM PERCIVAL JOHNSON, D.D., Archdeacon of Nyasaland, died in that country in October last. Details of his 50 years missionary work in that region have been published elsewhere, but in the midst of his many occupations he found time to collect and dry specimens of plants, which were sent to Kew at various times between 1884 and 1919. These were not only from Nyasaland, but also from Portuguese East Africa, and are enumerated in the Flora of Tropical Africa ; many of them belonged to species previously undescribed.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1929 ROYAL BOTANIC GARDENS, KEW

## VII.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*\*: II. E. M. MARSDEN-JONES AND W. B. TURRILL.

### NATURALLY OCCURRING HYBRIDS.

In the first paper of this series we described the results of artificially controlled self- and cross-pollinations of typical examples of the two species of *Silene* with which we are working. In this paper we record and describe naturally occurring hybrids which we have collected during intensive field studies in a limited number of localities. The conclusion that the plants to which special attention is called are of hybrid nature has been reached after a full study of all their characters made on living material. To enable the reader to criticize the soundness of our conclusions we also give descriptions of the probable parents when these were found near their supposed offspring. It seemed opportune to include descriptions of two hybrid plants found in the Herbaceous Ground at Kew. Specimens of all the plants described are preserved in the Genetical Herbarium at Kew.

In the descriptions which follow, the phrases "*maritima* type," "*vulgaris* type," and " $F_1$  type" refer to the descriptions and figures given in our first paper of the plant organs concerned. The plants there dealt with have proved to be excellent standards, reference to which saves much repetition.

### Chesil Beach, Dorset.

*Silene maritima* is very abundant on the landward slope along the greater part of the Beach, though its distribution is not continuous. Towards Portland we failed to find any trace of hybridization with *S. vulgaris*. At the other end of the beach near where the lane from Abbotsbury comes to the shore, however, we found clear evidence of crossing between the two species and search revealed the presence of *S. vulgaris* within a yard or two of the Beach, and only a short distance from the hybrid plants. The following descriptions will suffice to indicate the characters of the hybrids. They occurred on the margin of the shingle.

*Hybrid, Stock Plant 34.* Stems up to 9 dm. long, anthocyanin in stem and calyx. Leaves elliptic-lanceolate, 3.4 cm. long, 1 cm. broad, acute, somewhat dark green. Flowers up to 6 in number, hermaphrodite. Petals and lobes contiguous to slightly overlapping,

\*Continued from *K.B.* 1928, No. 1, p. 17.

scale of  $F_1$  type, petals 1.6 cm. long, 9 mm. broad, no anthocyanin blotch, blade lobed to two-thirds its length. Stigmata white. Immature seeds pink.\* Capsule of  $F_1$  type; carpophore 3.5 mm. long, 2 mm. broad. Mature seeds tubercled. The plant was suffering from *Marssonina*. The diameter of the root one inch below the surface was 3.8 cm.

*Hybrid, No. 22.* Stems 6 dm. long, anthocyanin in stem and calyx. Leaves elliptic-lanceolate, 3.6 cm. long, 9 mm. broad, acute, dark green. Flowers 5 to 16 in number, female. Petals and lobes not overlapping, scale of  $F_1$  type, petals 1.4 cm. long, 3.5 mm. broad, blade lobed to two-thirds its length. Stigmata white. Immature seeds pink. Capsule of  $F_1$  type; carpophore 2 mm. long, 2 mm. broad. Mature seeds tubercled. The plant was attacked by *Marssonina*.

Another hybrid was growing near this last one. It was hermaphrodite, had pink stigmata, pink immature seeds, and armadillo mature seeds.

Numerous plants of *Silene maritima* grew around these hybrids, especially on the seaward side of them. Most of the combinations of characters occurring in *S. maritima* were found in plants growing on the Chesil Beach at the Abbotsbury end and will be dealt with in our next paper. It was impossible to pick out any individuals as the parents of the hybrids. It was, however, different with the second parent, *S. vulgaris*, for after a very thorough search we found only one plant in the immediate neighbourhood. This was growing in grass at the corner of Abbotsbury Lane a few yards from the edge of the shingle and not far from the two hybrids last described. Its characters indicate that it was very probably one of the parents of these and we have therefore prepared the following description of it.

*S. vulgaris.* Stems glabrous, ascending then erect, 6.5 dm. high; with no barren shoots. Leaves broadly lanceolate to elliptic-lanceolate, apex acute, apiculate, lower narrowed to the base, upper with subcordate to amplexicaul base, average of fully developed leaves 6 cm. long, 2.2 cm. broad, margins ciliate; texture thinner and more flaccid than in *S. maritima*, colour distinctly green. Inflorescence with up to 7 flowers, which are more or less drooping when in bloom; bracts at first green-herbaceous, many becoming scarious later. Flowers female and hermaphrodite. Calyx ovoid, contracted at the apex, 1.5 cm. long, 1 cm. diam.; teeth equilaterally triangular, acute, apiculate. Petals with the blade lobed for two-thirds its length, 1.2 cm. long, 4.5 mm. broad, with the merest trace of a boss. Stigmata white. No mature capsules or seeds.

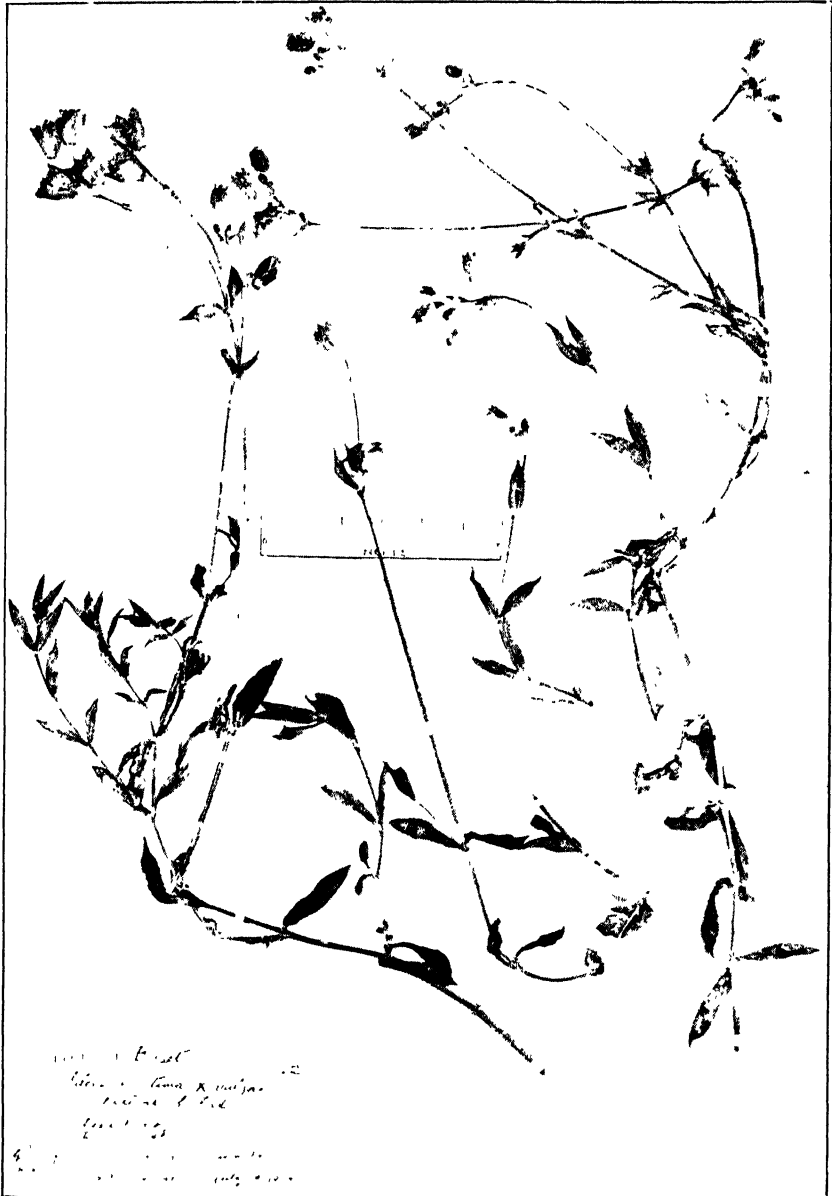
### Hurst Castle, Hants.

Another well-known shingle beach of the south of England is that which runs parallel to the main trend of the coast from Milford

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\* "Pale Laelia pink," Ridgeway pl. xxxviii. 67 VR. f.

PLATE I



*Silene maritima* X *S. vulgaris* Natural hybrid growing at the Abbotsbury end of the Chesil Beach, at the edge of the shingle with both parents near, July 18th, 1928





to Hurst Castle in Hampshire. From near Keyhaven to the farthest curved spit plants of *S. maritima* occur on the slope towards the marshes. The distribution is somewhat patchy. They occur near Keyhaven on the bank off the beach and against the road bounding the marshes. A considerable number of plants have been found near the middle of the beach and they are particularly abundant at the farthest end on all sides of the Castle. On the protected side of the Castle against the marshes the shingle has become stabilised and covered with a thick, often lush, turf of grasses and other plants. In this area we found a large plant of *S. vulgaris* with *S. maritima* growing near. Between the two parent species plants of obviously hybrid origin were growing. Other plants in the immediate neighbourhood also showed signs of hybridization. Since the *S. vulgaris* plant had certainly been established for several years at least there was time for  $F_2$  individuals and back-crosses to have been produced. We doubt, however, if the general shingle population of *S. maritima* will be affected, since our experience is that neither *S. vulgaris* nor the hybrids can survive extreme shingle conditions.

*Hybrid 1927.* Stems up to 3 dm. long. Leaves narrow lanceolate- or oblanceolate-oblong, 2.5 cm. long, 7 mm. broad. Flowers 1 to 3 in number. Hermaphrodite and female. Calyx of  $F_1$  type. Petals with contiguous lobes, 1.8 cm. long, 6 mm. broad, with blade lobed three-quarters the length, scale of  $F_1$  type. Stigmata white. Capsule of  $F_1$  type but verging towards *maritima*; carpophore 2 mm. long, 2 mm. broad. Seeds weak armadillo.

*Hybrid 1928.* Stems up to 3 dm. long. Leaves linear or lanceolate-linear, acute, average of well developed leaves 2.2 cm. long, 4 mm. broad. Flowers 1 to 3 in number. Calyx of  $F_1$  type. Petals and segments not contiguous, 1.6 cm. long, 8 mm. broad, with blade lobed three-quarters the length, scale of  $F_1$  type. Capsule of *maritima* type with reflexed teeth. Mature seeds tuberculed.

The following two plants, growing near the last, may have been the immediate or original ancestors of the last described hybrid. The *S. vulgaris* plant was probably the parent of both the above hybrids.

*S. vulgaris.* Stems up to 6 dm. long. Leaves elliptic-lanceolate, average of well-developed leaves 4 cm. long, 1 cm. broad. Flowers 6 to 12 in number, female. Calyx of the *vulgaris* type. Petals with segments overlapping, divided for two-thirds their length, 1.2 cm. long, 5 mm. broad, scale very small, little more than a boss. Stigmata white. Capsule of the *vulgaris* type but the teeth slightly spreading; carpophore 3 mm. long, 2 mm. broad.

*S. maritima.* Stems up to 3 dm. long. Leaves linear-lanceolate, acute, average of the well-developed leaves 2.8 cm. long, 5 mm. broad. Flowers 1 to 3 in number. Calyx of the *maritima* type. Petals overlapping, with the blade divided two-thirds its length, segments not overlapping, 1.9 cm. long, 1 cm. broad, scales well developed.

Stigmata white. Capsule of the *maritima* type ; carpophore 4 mm. long, 2.5 mm. broad. Seeds armadillo.

### Little Orme, North Wales.

In July, 1921, natural seed was collected from a plant of *S. vulgaris*, growing on the Little Orme, North Wales. On being sown at Potterne it produced plants which were obviously of hybrid origin, in addition to plants similar to the seed parent with *vulgaris* type of capsule and tubercled mature seeds. The following is a description of one of the hybrids.

Stems up to 3.6 dm. long. Leaves elliptic-lanceolate or oblong-lanceolate, acute, 3.7 cm. long, 8 mm. broad. Flowers up to 12 in number, hermaphrodite. Calyx of the  $F_1$  type. Petals with the segments not overlapping, with the blade divided for three-quarters its length, scale of the  $F_1$  type, 1.8 cm. long, 7 mm. broad. Capsule of  $F_1$  type. Mature seeds tubercled.

### South Devon.

At Dunmore, near Shaldon, South Devon, a plant of *S. vulgaris* and a hybrid growing 4 feet 8 inches from it were found on the roadside, about 220 yards from the coast, on the 15th of September, 1928. The following descriptions are of the *S. vulgaris* parent and of the hybrid.

*S. vulgaris*. Plant glabrous. Stems up to 7.5 dm. long. Leaves lanceolate or narrow-lanceolate, acute and apiculate, 5.4 cm. long, 1.3 cm. broad. Fruits up to 20 in number. Calyx of the *vulgaris* type, carpophore 2 mm. long, 1.5 mm. broad. Mature seeds tubercled. Plant without flowers when found.

*Hybrid*. Plant glabrous. Stems up to 5.5 dm. long. Leaves varying in shape from lanceolate to oblong-lanceolate, acute and apiculate, 4.7 cm. long and 1 cm. broad to 1.5 cm. long and 5 mm. broad. Flowers 2 to 7 in number, female. Calyx of  $F_1$  type. Petals with blades lobed to two-thirds their length, 1.4 cm. long, 4 mm. broad, petals and segments not overlapping, with a boss only. Stigmata tinged pink. Immature seeds pink. Capsule of the *maritima* type ; carpophore 2 mm. long, 2 mm. broad. Mature seeds tubercled.

On Lea Mount, Dawlish, South Devon, there is a not very large colony of plants which are predominantly *S. maritima*. The majority grow in the turf on Old Red Sandstone, but a small number occur on the actual face of the cliff to a height of about 50 feet. Most of the plants have rather large, narrowly oblanceolate leaves, and it would appear from the characters of the scales and capsules that some of them are hybrids. At the top of the cliff two plants of *S. vulgaris* were found, and an undoubted hybrid was growing practically with one of them. A *S. vulgaris* and a typical *S. maritima* plant from this locality and two hybrids are described below.

*S. vulgaris* No. 8. Plant glabrous. Stems up to 6 dm. high. Leaves narrowly lanceolate-oblong, acute, apiculate, 5.6 cm. long,

1.4 cm. broad. Calyx of the *vulgaris* type. Capsule of the *vulgaris* type; carpophore 2 mm. long, 1.5 mm. broad. Mature seeds tubercled. No flowers.

*S. maritima* No. 6. Plant glabrous. Stems up to 4 dm. long, prostrate. Leaves oblanceolate, acute, 2.2 cm. long, 6 mm. broad. Calyx of *maritima* type. Sex hermaphrodite. Petals slightly overlapping, lobes not overlapping, 2.3 cm. long, 1 cm. broad, good scale. Stigmata white. Immature seeds pink. Capsule of *maritima* type; carpophore 4 mm. long, 3 mm. broad. Mature seeds tubercled.

*Hybrid* No. 9. Growing with *S. vulgaris* No. 8. Numerous plants of *S. maritima* around and below. Stems up to 6 dm. high. Leaves lanceolate- to oblanceolate-oblong, acute, apiculate, 4.4 cm. long, 1.1 cm. broad. Calyx of  $F_1$  type. Capsule of  $F_1$  type; carpophore 3 mm. long, 2 mm. broad. Mature seeds tubercled. No flowers.

*Hybrid Stock Plant* 48, at foot of Lea Mount. Growing with numerous plants of *S. maritima* and probable hybrid segregates around, and *S. vulgaris* No. 8 at the top of the cliff. Plant glabrous. Stems up to 9 dm. long, trailing. Leaves elliptic-oblong to oblanceolate, pinched apiculate, 3 cm. long, 1.1 cm. broad. Calyx of  $F_1$  type. Sex hermaphrodite and female. Petals and lobes not overlapping, petals 1.5 cm. long, 4.5 cm. broad, boss only, no trace of scale. Capsule of  $F_1$  type; carpophore 3 mm. long, 2 mm. broad. Mature seeds tubercled.

### **Descriptions of two hybrid plants cultivated in the Herbaceous Department, Royal Botanic Gardens, Kew, 25.6.28.**

#### **I. Cultivated as *Silene maritima*.**

Stems 5 dm. long. Leaves linear- or narrowly elliptic-lanceolate, acute, 2 cm. long, 4 mm. broad. Calyx of  $F_1$  type. Petals lobed to two-thirds the length of their blades, segments not overlapping, 1.5 cm. long, 5 mm. broad, scale of  $F_1$  type, very small. Sex female. Stigmata white. Immature seeds pink. Capsule of  $F_1$  type. Mature seeds tubercled.

#### **II. Cultivated as *S. cucubalus*.**

Stems 5 dm. long. Leaves lanceolate-oblong, acute, 3.1 cm. long, 6 mm. broad. Calyx of  $F_1$  type. Petals with blades lobed two-thirds of their length, segments not overlapping, 2.1 cm. long, 8 mm. broad, scale of  $F_1$  type. Sex hermaphrodite. Stigmata white. Immature seeds pink. Capsule of  $F_1$  type; carpophore 3 mm. long, 1.5 mm. broad. Mature seeds weak tubercled.

The above plants are of special interest as additional illustrations of how readily the two species cross when brought into contact. Without doubt they were derived from parent plants of each species cultivated near together at Kew or in another botanic garden, and unintentionally crossed by the visits of insects.

## Summary and conclusions.

Details of the occurrence and descriptions of naturally occurring hybrids between *Silene maritima* and *S. vulgaris* are given. These have now been found by us on the Chesil Beach, Dorset, Hurst Castle Shingle Beach, Hampshire, Dunmore and Dawlish, South Devon, and Little Orme, North Wales. Descriptions of probable parents found growing with some of the hybrids are also given.

It is known from our previously published work that considerable quantities of viable seed are obtainable when the two species are artificially crossed. Additional work, at present unpublished, has indicated that the fertility on crossing the species is often practically as high as that of intra-specific pollination and fertilization. Moreover, the range of variation within each species is as great, when all characters are considered, as the differences normally exhibited by the two species. There seems, in other words, no valid taxonomic or genetic reasons why the two species should not regularly interbreed and, indeed, amalgamate as one 'polymorphic' species. And yet they have not done so, nor is there any indication that that will be their fate in the near future. Natural hybrids between them are relatively rare and only occur near the parents. Ecologically the two species are quite distinct. *S. maritima* occupies maritime habitats, especially shingle beaches and cliffs, or stony ground at considerable altitudes.\* *S. vulgaris*, in this country, is an inland plant of grassy downs, arable land, roadsides, and broken ground. Hybrids occur only in the narrow zone where the species meet.

These, amongst other facts, have led us to conclude that the two species are ecologically separated and that physiological differences not obviously connected with their gross morphology keep them distinct. Suggestions as to the nature of these differences are reserved for a future paper.

## VIII.—THE CORRECT SPELLING OF CERTAIN GENERIC NAMES: IV.† T. A. SPRAGUE.

A supplementary list containing 55 additional generic names the spelling of which is in dispute has been prepared in response to enquiries from various sources. Investigation of the subject has led to the following conclusions, which it is hoped may be endorsed by the next International Botanical Congress. There seem to be two feasible methods of attaining uniformity in the spelling of generic names. The method here advocated is the strict application of the International Rules in each case, except where conservation of a later spelling (*e.g. Bougainvillea*) may seem desirable. An alternative is the establishment of an International list of all generic names with their accepted spellings.

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\*We are not yet certain of the status of high-mountain plants generally referred to *S. maritima*.

†See *K.B.* 1928, pp. 113, 285, 337.

I. The original spelling of a generic name must be retained except in the case of a typographic error (e.g. *Fissenia* for *Kissenia* and *Ferdinandia* for *Fernandoa*) or of an *unintentional* orthographic error (e.g. *Hyeronima* and *Hieronima* for *Hieronyma*)—vide Internat. Rules, ed. 2, Art. 24, 50, 57.

*Note 1.* The words “original spelling” mean the spelling adopted when the name was *effectively* published (e.g. *Mesembryanthemum*, not *Mesembrianthemum*).

*Note 2.* Previous spellings should, however, be taken into consideration in certain cases (e.g. *Amaranthus*), in order to decide whether a philologically corrupt form or an erroneous spelling of a generic name, employed by the author who effectively published it, was adopted by him from a previous work, in which case the spelling is to be regarded as intentional, or had not been used previously, in which case the spelling *may* be due to an *unintentional* orthographic error.

II. In determining the original spelling of Linnean generic names, Sp. Pl. ed. 1 (1753) and Gen. Pl. ed. 5 (1754) are treated as if they had been published simultaneously. Where different spellings were adopted by Linné in these two works, the correct form should be determined by means of the following considerations.\*

1. If Linné subsequently to 1753-54 consistently adopted one of the spellings, that spelling should be accepted as his choice, e.g. *Thuja* (not *Thuya*).

2. If not, the spelling which is more correct philologically should be accepted, e.g. *Agrostemma* (not *Agrostema*).

3. If the two spellings are equally correct philologically and there is a great preponderance of usage in favour of one of them, that should be accepted, e.g. *Rhododendron* (not *Rhododendrum*)—vide Art. 5.

4. If the two spellings are equally correct philologically, and there is no great preponderance of usage in favour of one of them, then the form that is in accordance (or more nearly in accordance) with the Recommendations should be accepted, e.g. *Ludwigia* (not *Ludvigia*), *Ortegia* (not *Ortega*).

The four papers of the present series embody the results of an investigation into the orthography of 181 generic names. It has repeatedly been found in the course of this enquiry that two or more authors, who assumed the right of “correcting” the spelling of a particular generic name, have “corrected” it in two or more different ways, good examples being *Buddleja*, *Cypripedium*, *Furcraea*, *Pereskia*, *Phaius* and *Triopteris*. It seems desirable to re-emphasize the fact that such corrections, when based on *purely philological* grounds, are absolutely contrary to the International Rules of Nomenclature (see *Kew Bull.* 1928, p. 340). It should in fairness be pointed out that most of the “corrections” in question were made

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\*See *K.B.* 1928, pp. 294-296, 341. The case of *Rhododendron* shows that precedence should be given to “general usage” over “agreement with the Recommendations.”

before the appearance of the present International Rules. Many botanists, however, still seem to think that the Rules require that Greek terminations of botanical names should be latinized, whereas this is merely a Recommendation for the formation of such names in the future, and even so it does not apply to certain instances of Greek terminations which are sanctioned by custom (see Art. 7).

One unfortunate result of the Rule that the original spelling of a generic name must be retained is that what is virtually the same basal word occurring in a series of parallel generic names in the same family must in certain instances be spelt in two or even three different ways. Thus in the family Malpighiaceae the word denoting the wing of the fruit appears as *-pteris*, *-pterys* and *-pteryx*. (*Triopteris*, *Tetrapteris*; *Aspidopterys*, *Brachypterys*; *Rhinopteryx*.) The only method of securing uniformity of termination under the Rules would be by means of conserving particular spellings. For this there are precedents, e.g., *Vochysia*† has been conserved against *Vochy*, *Cajanus* against *Cajan*, and *Sesbania* against *Sesban*. But in these instances there was a great preponderance of usage in favour of *Vochysia*, *Cajanus*, and *Sesbania* respectively, and there is no such preponderance in the case of the malpighiaceous generic names in question.

Where a particular spelling of a generic name is widely used by the general public, or in horticulture, as well as by botanists in general, but has to be rejected under a strict application of the Rules of Nomenclature, there seems to be a good case for its conservation. It is accordingly suggested that the spellings *Bougainvillea* (vide *Kew Bull.* 1928, p. 349) and *Helichrysum* should be conserved. The cases for the conservation of the forms *Haplolophium* (vide *Aplolophium*), *Haplopappus* (vide *Kew Bull.* 1928, 344), *Haplophyllum* Reichb. (l.c. 345), and *Heleocharis* (vice *Eleocharis*), are not so strong, as these names are less widely used. *Aubrietia* is exceedingly well known, but differs so little from *Aubrieta* (the correct spelling under the Rules), that it is perhaps hardly worth while conserving it.

**Alloeanthus** *Thwaites* (hic corr.). *Allaeanthus* *Thwaites* in Hook. Kew. Journ. Bot. 1854, vi. 302, t. 9 B, errore orthographico; *Thwaites*, Enum. Pl. Zeyl. 263 (1861); Bur. in DC. Prodr. xvii. 222 (1873); Hook. f. Fl. Brit. Ind. v. 490 (1888); Trimen, Handb. Fl. Ceylon, iv. 102 (1898). *Allacanthus* Engl. in Engl. et Prantl, Nat. Pflanzenfam. iii. Abt. 1, 74 (1888).—It seems clear that *Allacanthus* was an *unintentional* orthographic error for *Alloeanthus*, from ἄλλοις, different in appearance, and ἄθος, flower, a name evidently given by *Thwaites* in allusion to the very different appearance of the male and female inflorescences (and flowers). The spelling *Alloeanthus* may

†The list of nomina conservanda gives "*Vochysia* Juss.," but *Jussieu* spelt the name *Vochisia*. It was *Poiret* who proposed the spelling *Vochysia*. In the circumstances it is doubtful whether *Vochisia* Juss. or *Vochysia* Poir. is intended to be conserved.

therefore be attributed to Thwaites. He made the same slip in publishing the following generic name.

**Alloeophania** *Trimen*, Handb. Fl. Ceylon, ii. 301 (1894). *Allaeophania* Thwaites, Enum. 147 (1859); Hook. f. Fl. Brit. Ind. iii. 48 (1880).—Thwaites mentioned that “in general appearance this species [*A. decipiens*] bears a very great resemblance to *Hedyotis nodulosa* Arn.” which belongs to a different tribe of the Rubiaceae. Evidently he formed the generic name from ἀλλοῖος, different, and — φάνεια, appearance, because the shrub had the appearance of a very different genus. The spelling *Alloeophania* may therefore be ascribed to Thwaites.

**Androsiphon** *Schlechter* in Notizbl. Bot. Gard. Berlin, ix. 147 (1924).—Under Art. 24, the spelling of this and the following name may not be altered. Hence they are to be regarded, under Art. 57, as different names. There does not seem to be any serious risk of confusion, as *Androsiphon* belongs to Liliaceae, whereas *Androsiphonia* is a genus of Passifloraceae.

**Androsiphonia** *Stapp* in Journ. Linn. Soc., Bot. xxxvii. 101 (1905).

**Antigonia** *Vell.* Fl. Flum. 186 (1825); et op. cit. iv. t. 145 (1827).

**Antigonon** *Endl.* Gen. 310 (1837). *Antigonum* *Reichb.* Nomencl. 163, n. 6334 (1841). *Antigonium* *A. Juss.* in Orb. Dict. x. 386 (1849).—*Antigonon* is not invalidated by *Antigonia* *Vell.* (1825). Under Art. 57, they are regarded as different names. Hence there is no justification under International Rules for replacing *Antigonon* by *Corculum* *Stuntz* (1913).

**Atamosco** *Adans.* Fam. ii. 57 (1763). *Atamosko* *Adans.* l.c. 522. *Atamasco* *Rafin.* Neogenyton, 3 (1825).—Adanson cited figures given by Plukenet, Morison and Catesby, as the basis of his genus *Atamosco*. Plukenet (Alm. 220) spelt the name as “*Atamusco*” (under *Lilio-Narcissus Indicus pumilus monanthes albus*); Morison (Hist. ii. 366, n. 30, sect. 4, t. 24, fig. 4) gave it as “*Atamosco vulgo hortulanis dictum*”; and Catesby (Carol. App. 12) had “*Attamusco Lily*.” Adanson adopted Morison’s spelling and his ascription of the name to the “*Hortulani*.” Although it is now known that the correct form of the vernacular name of the *Atamasco Lily* (*Zephyranthes*) is “*Atamasco*,” the spelling chosen by Adanson must be retained under Art. 24 of the Rules.

*Atamosco* *Adans.* antedates the well-known generic name *Zephyranthes* *Herb.* (1821), but the latter has recently been proposed for conservation (Fernald and Weatherby, Circular dated December, 1927).

**Balduina** *Nutt.* (vide *Kew Bull.* 1928, 346).—Definite evidence that Nuttall latinized Baldwin’s name as “*Balduinus*” has now come to light. A new *Polygala* collected by Dr. Baldwin [sic] in Florida was described by Nuttall (Gen. ii. 90) under the name *P. Balduini*.



**Bischofia** *Blume* Bijdr. 1168 (1826) ; Fl. Jav. Praef. p. vi. in adnot. (1828). *Bischoffia* *Decne* in Orbigny, Dict. ii. 580 (1842).—*Blume* named the genus in honour of G. W. Bischoff, but appears deliberately to have used the spelling *Bischofia* with one "f", as being a more acceptable Latin form. The fact that he retained this spelling in the preface to his 'Flora Javae,' where he corrected *Acanthophippium* to *Acanthephippium*, and *Etaeria* to *Hetaeria*, etc., confirms this view.

**Byttneria** *Loefl.* Iter Hisp. 313 (1758) ; Linn. Syst. ed. 10, 939 (1759) ; DC. Prodr. i. 486. *Bytneria* *Jacq.* Hort. Vindob. i. 10 (1770). *Büttneria* *Murr.* Syst. 197 (1774). *Buttneria* *Aubl.* Hist. Pl. Guiane, i. 241 (1775). *Büttnera* *J. F. Gmel.* Syst. ii. 404 (1791). *Bütneria* *Jacq.* Hort. Schoenbr. i. 46 (1797). *Buettnera* *Link.* Enum. i. 243 (1821). *Buettneria* *Benth.* Fl. Hongkong. 39 (1861).—The original spelling *Byttneria* should be retained under the Rules. *Loefling* and *Linné* were at liberty to latinize *Buettner's* name as "Byttnerius," and consequently to form the generic name *Byttneria*. The case is comparable to those of *Furcraea* (*Fourcroya*), *Jussiaea* (*Jussieu*) and *Valantia* (*Vaillantia*), q.v.

**Calodendrum** *Thunb.* Nov. Gen. ii. 41 (1782). *Calodendron* *Juss.* in Dict. Sc. Nat. vi. 258 (1805).

**Cassytha** *L.* Sp. ed. 1, 35 (1753). *Cassya* *L.* Gen. Pl. ed. 5, 22 (1754).—*Linné* took the name from *Osbeck*, who spelt it *Cassytha* when he published the account of his travels (Iter, 243 ; 1757). Hence the spelling *Cassytha* which appeared in Gen. Pl. ed. 5 and 6 may be regarded as a lapsus calami on the part of *Linné*, or alternatively as a typographical error.

The name *Cassytha* was used by *Fuchs*, Hist. 348 (1542) for the genus now known as *Cuscuta*. *Rumphius*, Herb. Amboin. v. 491, t. 184, fig. 4, used both *Cussuta* and *Cussutha*, for *Cassytha filiformis* *L.*

**Cephalipterum** *A. Gray* in Hook. Kew Journ. Bot. iv. 271 (1852). *Cephalopterum* *Post et Kuntze*, Lexic. Gen. Phan. 110 (1903).—The genus is distinguished from *Helipterum* by its glomerate capitula *inter alia*, and the name was a compound of κεφαλή and *Helipterum*. The fact that the name was telescoped is not a valid reason for altering it under the Rules. See *Kew Bull.* 1928, p. 340.

**Cleistochlamys** *Oliv.* in Journ. Linn. Soc. ix. 175 (1867). *Clistochlamys* *Post et Kuntze*, Lexic. Gen. Phan. 130 (1903).—The Greek vowels "ει" are sometimes transliterated "ei," as in *Cheiranthus*, sometimes "i" as in *Chimonanthus*. The original spelling should be retained in such cases.

**Clistoyucca** *Trelease* in Rep. Miss. Bot. Gard. xiii. 41 (1902). *Cleistoyucca* *Eastw.* in Occas. Papers Calif. Acad. Sc. ix. 33 (1905).—See the remarks under *Cleistochlamys*.

**Clutia** L. Sp. 1042 (1753); Gen. Pl. ed. 5, 464 (1754). *Cluytia* Willd. Sp. Pl. iv. 879 (1806).—The genus *Clutia* was named by Boerhaave in 1720 in honour of Outger Cluyt, who latinized his own name as "Augerius Clutius." Linné accepted the spelling *Clutia* in 1753-54 and no-one seems to have changed it until 1806, when Willdenow added a "y." Linné was free to adopt the euphonious Latin form *Clutia*, and Willdenow's alteration of the name is unwarranted by the Rules. The spelling *Cluytia* is commonly but erroneously attributed to Reichard, Gen. Pl. ed. 7, 530 (1778).

**Daniellia** J. J. Benn. in Pharm. Journ. xiv. 252 (1854). *Daniella* Benth. in Benth. et Hook. f. Gen. Pl. i. 580 (1865).—The generic name commemorates Dr. William Freeman Daniell, and is formed in accordance with Rec. IVb of the International Rules. In any case Bennett was at liberty to latinize Daniell's name as he pleased.

**Diplorhynchus** Welw. ex Ficalho et Hiern in Trans. Linn. Soc., ser. 2, Bot. ii. 22 (1881). *Diplorrhynchus* K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. iv. Abt. 2, 142 (1895).—This case is comparable with that of *Osmorhiza* (Kew Bull. 1928, 359). The addition of a second "r" is not permissible under Art. 24.

**Dolichokentia** Becc. (hic corr.). *Dolicokentia* Becc. in Webbia, v. 74, 113 (1921). *Dolycokentia* Becc. l.c. t. 8.—Beccari evidently intended to combine the adjective "dolichos" with the generic name *Kentia*, and the omission of the "h" may therefore be regarded as an *unintentional* orthographic error. The fact that the name is differently spelt in the text and on the plates suggests that he wrote it down carelessly; and he died before the paper appeared.

**Elaeodendron** [J. F. Jacq. ex] Jacq. Ic. Pl. Rar. i. t. 48 (1781-84); et op. cit. p. 5 (1786); J. F. Jacq. in Nov. Act. Helvet. i. 36 (1787). *Elaeodendrum* Murr. Syst. 241 (1784). The plates of Jacquin's *Icones* were published in parts during the period 1781-86. As Murray cited "Jacq. icon. rar." he had evidently seen the plate in question, so that it must have been published not later than 1784; Jacquin's text, on the other hand, was presumably published as a whole in 1786 with the last instalment of the plates. It contains references to Murray's edition of Linné's *Systema* (1784).

Under Art. 37, 38 of the International Rules, a plate containing analyses is accepted as equivalent to a description: hence the earliest effective publication of the generic name was in the form *Elaeodendron*, which should be accepted as the correct spelling.

**Eriodendron** DC. in DC. Prodr. i. 479 (1824). *Eriodendrum* Post et Kuntze, Lexic. Gen. Phan. 204, 598 (1903).—*Eriodendron* DC. is an invalid name, since it was based on *Bombax pentandrum* L. which is also the type of *Ceiba* Mill. (1754). The correct name of the genus is *Ceiba* Mill.

**Erythroxyllum** P. Br. Hist. Jam. 278 (1756). *Erythroxyllon* L. Syst. ed. 10, 1035 (1759).—Briquet (Bull. Herb. Boiss. sér. I, ii. 64-68 : 1894) came to the conclusion that Patrick Browne's generic names were valid, whereas Rendle (Journ. Bot. 1912, 129), who did not cite Briquet's paper, held them to be invalid on the ground that "his descriptions are of species only." Without entering into a discussion of this general question, it may be stated that *Erythroxyllum* P. Br. appears to be a valid generic name for the following reasons. Browne based the new generic name *Erythroxyllum* on his first species *Erythroxyllum*. 1. *foliis ellipticis, lineis binis longitudinalibus subtilis notatis: fasciculis florum sparsis*. He gave a description under 6 headings from "Periantium" to "Semen" exactly corresponding with those of the genera in Linn. Gen. Pl. ed. 5 (1754), which work he apparently used as a model. The only two reasons for not regarding Browne's description as generic, are (1) that it occurs *under* the first species, after the specific diagnosis and synonymy, instead of preceding the account of the two species, a question of arrangement, and (2) that it contains the statement that the styles are longer than the stamens, which applies only to his first species, the diagnostic phrase of the second species including the information "stylis brevissimis." Browne's remarks under species 2 show that he at all events regarded his description as containing the essential generic characters. "This tree differs much from the foregoing, both in shape and the manner of its growth; but it answers the essential characters thoroughly." The fact that a character peculiar to the type-species is inserted in a generic description can hardly be held to invalidate that generic name.

**Ferdinanda** Lag. Gen. et Sp. Pl. 31 (1816).

**Ferdinandusa** Pohl, Pl. Bras. Ic. ii. 8, tt. 106—108 (1831). *Ferdinandea* Pohl in Flora, x. 153 (1827).—Pohl was justified in altering the generic name since in its original form it was invalidated by *Ferdinanda* Lag. (1816). It is unfortunate however that he should have chosen such a badly formed substitute (*Ferdinandus-a*).

**Fernandoa** Welw. ex Seem. in Journ. Bot. iv. 123 (1866). *Ferdinandia* Welw. ex Seem. l.c. iii. 330 (1865), errore typographico. *Ferdinandoa*, Seem. l.c. viii. 280 (1870). *Ferdinanda* Benth. et Hook. f. Gen. Pl. ii. 1047 (1876), in obs. *Fernandia* Baill. Hist. Pl. x. 47 (1888).—The generic name was originally published as *Ferdinandia*, but a corrigendum appeared in the following year explaining that this was a misprint for *Fernandoa*, the name of the then King of Portugal being "Fernando." In any case the existence of the valid name *Ferdinanda* Lag. (1816), automatically invalidates *Ferdinandia* Welw. ex Seem. (1865).

**Gerardiina** Engl. in Engl. Jahrb. xxiii. 507 (1897).—Named from its similarity in general appearance with the allied genus *Gerardia* L. (Scrophulariaceae). The latter commemorates John Gerard

(Plum. Nov. Gen. 30 : 1703). It is perhaps regrettable that Engler should have chosen a generic name so closely approximating to *Gerrardina* Oliv., but as the two genera belong to different families, and as their names differ in two letters, there does not seem to be any serious risk of confusion, and both will stand under the International Rules.

**Gerrardina** Oliv. in Hook. Ic. Pl. t. 1075 (1870). *Gerrardiana* B. D. Jackson, Ind. Kew. i. 1024 (1893), sphalm.—*Gerrardina* (Samydaceae) commemorates the Natal collector, W. T. Gerrard, in whose honour *Gerrardanthus* Harv. was also named.

**Glechoma** Boehm. in Ludw. Def. Gen. Pl. ed. 3, 115 (1760) ; Gmel. Fl. Sibir. iii. 242 (1768). *Glecoma* L. Sp. ed. 1, 578 (1753) ; Gen. Pl. ed. 5, 251 (1754).—The generic name was published as *Glechoma* in L. Gen. Pl. ed. 1, 171 (1737), and was so spelt in Hort. Cliff. 307 (1737), Gen. Pl. ed. 2, 269 (1742), Fl. Suec. 175 (1745), Syst. Nat. ed. 6, impr. Lipsiae, 114 (1748), Phil. Bot. 34, 152, 187 (1751). In Phil. Bot. 187 Linné derived the name from γλήχων, *Pulegium*, so that the spelling with "ch" is philologically correct. In the circumstances it would have been absurd for Linné deliberately to have omitted the "h," so that we may be reasonably certain that the spelling *Glecoma* was due to a lapsus calami on his part, or to a typographical error. Boehmer evidently took that view, as he cited "*Glechoma* L. Gen. Pl. ed. 5, n. 634." The spelling *Glechoma* may accordingly be attributed to Linné.

**Guaiacum** L. Gen. Pl. ed. 5, 179 (1754). *Guajacum* L. Sp. Pl. ed. 1, 381 (1753).—Linné used both forms, both before and after 1753-54. He adopted *Guaiacum* in Gen. Pl. ed. 1, 140 (1737), ed. 2, 180 (1742), and ed. 6, 208 (1764) ; and *Guajacum* in Hort. Cliff. 187 (1737), Syst. Nat. ed. 6, reimpr. Lipsiae, 104 (1748), Mat. Med. 70 (1749), Sp. Pl. ed. 2, 546 (1762), and Syst. Nat. ed. 10, 1018 (1759). The name was originally published as *Guaiacum* by Plumier, who explained it as follows : "*Guaiacum*, vulgo guaiac, nomen est americanum, satis apud Europam notum" (Nov. Pl. Am. Gen. 39 : 1703). Of the two forms used by Linné in 1753-54, *Guaiacum* should be accepted as the correct spelling, not only because it was the first pre-Linnean spelling, but more especially because there is a *great preponderance of botanical usage* in its favour (vide supra, p. 39, suggestion II. 3.).

*Guaiacum* was accepted, for example, in Juss. Gen. 296 (1789), Willd. Sp. ii. 538 (1799), Pers. Syn. i. 462 (1805), A. Juss. in Mém. Mus. Hist. Nat. Par. xii. 456 (1823), DC. Prodr. i. 706 (1824), Spreng. Syst. ii. 322 (1825), Endl. Gen. 1164 (1840), Benth. et. Hook. f. Gen. Pl. i. 267 (1862), Hemsl. Biol. Centr.-Amer., Bot. i. 159 (1879), Dalla Torre et Harms, Gen. Siphonog. 249 (1901), North Amer. Fl. xxv. 105 (1910), Small, Fl. S.E. United States, ed. 2, 671 (1913), and Fawcett et Rendle, Fl. Jam. iv. 163 (1920).

*Guajacum* was adopted in Engl. et Prantl, Nat. Pflanzenfam. iii. Abt. 4, 82 (1890), Post et Kuntze, Lexic. Gen. Phan. 258 (1903), and Urb. Symb. Antill. viii. 317 (1920).

**Hetaeria** *Blume*, Fl. Jav. praef. p. vii. (1828) in adnot. *Etaeria* *Blume*, Bijdr. 409, t. 14 (1825).—Blume explained (l.c., p. v), that several of the generic names proposed by him were faulty in construction, owing to his remoteness from Europe and consequent lack of literary resources. As he himself changed the spelling *Etaeria* to *Hetaeria*, it may reasonably be assumed that the omission of the initial "H" was due to an *unintentional* orthographic error on his part, such as may be corrected under the provisions of Art. 57.

**Hieronyma** *Baill.* Étude gén. Euphorb. 658 (1858); *Muell. Arg.* in DC. Prodr. xv. sect. 2, 268 (1866), et in Mart. Fl. Bras. xi. pars 2, 19 (1873); *Benth.* in Benth. et Hook. f. Gen. Pl. iii. 284 (1880); *Dalla Torre et Harms*, Gen. Siphonog. 271 (1901). *Hyeronima* *Allem.* in Trab. Soc. Velloz. (1848), in textu; et in Arch. Palest. Sc. Rio de Janeiro, i. 56, cum tabula (1858). *Hieronima* *Allem.* l.c. (1848), in tabula. *Hieronymia* *Pax* in Engl. et Prantl, Nat. Pflanzenfam. iii. Abt. 5, 28 (1890).—The genus was dedicated by *Allemão* as follows: "Hoc genus dixi in memoriam *Jeronimo Serpa* nuper defuncti, qui Horto Botanico Olindensi praefuit, et Elementa Botanices cl. *Ach. Richard* ex gallico sermone in vernaculum vertit." *Allemão* evidently wished to give the classical equivalent of the Portuguese name *Jeronimo*, with a feminine termination, i.e., *Hieronyma*, but transposed the "i" and the "y" in the text and replaced the "y" by an "i" on the plate. As the original spellings *Hyeronima* and *Hieronima* are due to *unintentional* orthographic errors, it is legitimate to discard them in favour of *Hieronyma*. As will be seen from the references given above, this conclusion has been generally adopted. For some unexplained reason, however, the form *Hyeronima* was upheld in Ind. Kew. i. 1186 (1893).

**Howea** *Becc.* Malesia, ii. Errata (1886). *Howeia* *Becc.* Malesia, i. 66 (1877).—As *Beccari* himself corrected the original spelling *Howeia*, it may be regarded as an *unintentional* orthographic error.

**Hypochoeris** *L.* Gen. Pl. ed 5, 352 (1754). *Hypochaeris* *L.* Sp. Pl. ed. 1, 810 (1753).—From 1737 onwards *Linné* seems to have employed both spellings, *Hypochoeris* and *Hypochaeris*, indifferently. *Hypochoeris* occurs in Gen. Pl. ed. 1, 238 (1737), Fl. Lapp. 231 (1737), Gen. Pl. ed. 2, 377 (1742), Phil. Bot. 187, 335 (1751), Gen. Pl. ed. 6, 405 (1764). *Hypochaeris* occurs in Hort. Cliff. 385 (1737), Fl. Suec. ed. 1, 227 (1745), Syst. Nat. ed. 6, reimpr. Lipsiae, 125 (1748), Hort. Upsal. 240 (1748), Phil. Bot. 29, 152, 273 (1751), Fl. Suec. ed. 2, 276 (1755), Syst. Nat. ed. 10, 1197 (1759), Sp. Pl. ed. 2, 1140 (1763).

It seems clear that *Linné* generally worked too rapidly to concern himself about such minutiae as whether a particular diphthong should be spelt "ae" or "oe." In a book which passed through

two or more editions, the spelling adopted by him in the first edition was generally retained in all later ones. Even in his ' *Philosophia Botanica* ' he did not take the trouble to adopt a uniform spelling of *Hypochoeris*, but on p. 187 of that work where he gave the *derivation of the name*, from χοῖρος, porcus, and ὑπό, diminutivum, he spelt it *Hypochoeris*, and he presumably would exercise most care in spelling when he was treating a generic name as a *name*, and supplying its derivation. Hence the spelling *Hypochoeris* may be regarded as his definite choice. Even if this is not admitted, *Hypochoeris* should still be adopted, as Linné used both spellings in 1753-4, and *Hypochoeris* is philologically correct, whereas *Hypochoaeris* is not (vide supra, p. 39, suggestion II. 2.).

**Lefebvrea** A. Rich. in Ann. Sc. Nat. sér. 2, xiv. 260 (1840). *Lefeburea* Endl. Gen., Suppl. 2, 69 (1842). *Lefeburia* Lindl. Veg. Kingd. 778 (1847).—The generic name was given by A. Richard in compliment to Lefebvre, a lieutenant in the French navy, and was formed in accordance with Rec. IVa of the International Rules.

**Mammillaria** Haw. Syn. Pl. Succ. 177 (1812). *Mamillaria* Reichb. in Moessler, Handb. ed. 2, i. p. 1 (1827).—Haworth published the generic name as " *Mammillaria* (Mammillary Thistle)," basing it on *Cactus mammillaris* L. Sp. 466. In his description he used the spelling "mammillae" not "mamillae" for the tubercles characteristic of the genus. The fact that "mamilla" is the correct Latin form of that word does not justify the alteration of the spelling *Mammillaria* deliberately chosen by Haworth. The name is incorrectly included as " *Mamillaria* Haw." in the list of nomina conservanda, but that spelling was merely taken from Dalla Torre et Harms, Genera Siphonogamarum. There is no evidence that the question of conserving the later (and philologically preferable) spelling " *Mamillaria* Reichb." was ever considered by the International Congress.

**Markea** L. C. Rich. in Act. Soc. Hist. Nat. Paris, i. 107 (1792). *Lamarkea* Pers. Syn. i. 218 (1805). *Lamarckia* Vahl in Danske Nat. Selsk. Skrivt. vi. 93 (1810). *Marckea* A. Rich. in Dict. Class. Sc. Nat. x. 168 (1826). *Lamarkia* G. Don, Gen. Syst. iv. 487 (1837). *Lamarckea* Steud. Nomencl. ed. 2, ii. 6 (1841).—L. C. Richard appears to have latinized Lamarck's name as "Markeus," omitting the "c" on the ground that the combination of letters "ck" could not occur in a Latin word. In any case he published his new genus of Solanaceae under the name *Markea*, and that spelling must be retained. The fact that five different variants for it were proposed during the period 1805-1841 illustrates the confusion sometimes brought into nomenclature by those who seek to "correct" generic names.

**Mezoneuron** Desf. in Mém. Mus. Hist. Nat. Paris, iv. 245 (1818). *Mezoneurum* DC. in DC. Prodr. ii. 484 (1825).—There is no valid philological reason for latinizing the termination, since many Greek

nouns retained their original endings when brought into the Latin language (vide *Rhododendron*, p. 50). Nor are such changes of the original spelling permitted under the Rules of Nomenclature.

**Milletia** *Wight et Arn.* Prodr. 263 (1834). *Milletia* Meisn. Gen. i. 95, ii. 68 (1837).—There is no justification for the spelling *Milletia*, which was adopted by Durand and Jackson in the first Supplement to the Index Kewensis: the genus was named in honour of Dr. Charles Millett, of Canton.

**Mitracarpus** *Zucc. apud Schult.* in Roem. et Schult. Syst. iii. Mant. 210 (1827), in obs., et l.c. 399 (index). *Mitracarpum* Cham. et Schlecht. in Linnaea, iii. 358 (1828). *Mithracarpus* Reichb. Consp. 94 (1828). *Mitrocarpum* Hook. et Arn. in Hook. Bot. Misc. iii. 360 (1833). *Mitracarpium* Benth. in Hook. Journ. Bot. iii. 238 (1841). *Mitrocarpus* Post et Kuntze, Lexic. Gen. Phan. 369 (1903.)—For nearly sixty years the spelling *Mitracarpum* was attributed to Zuccarini, whereas the generic name, as published, was actually *Mitracarpus*. The origin of this blunder was as follows: Schultes mentioned the new generic name in the *accusative* case in a Latin note after *Spermacoce*: “Genus a *Spermacocibus* separandum, et ad quod plures hujus generis species brasilienses sibi pertinere videntur, benigne communicavit cl<sup>s</sup> Zuccarini, ob superiorem capsulae partem deciduam mitraeformem *Mitracarpum* ab illo dictum. . . . Zuccarini in litt. qui hujus generis unicam nobis indigitavit speciem: “*M. scabrum* in sabulosis prope Forte Louis crescentem.” Had Chamisso and Schlechtendal consulted the index to Schultes, Mantissa, they would have discovered that the generic name was *Mitracarpus*, and the name of the species *M. scaber*. The facts of the case were pointed out in 1886 by A. Gray (Syn. Fl. N. Am. vol. i. part 2, p. 32), cited by K. Schum. in Mart. Fl. Bras. vol. vi. pars. 6, 79 (1888), but have nevertheless been overlooked in recent works.

**Montanoa** *Less.* Syn. 420 (1832). *Montañoa* Cerv. in La Llave et Lexarza, Nov. Veg. Descr. fasc. ii. 11 (1825). *Montagnaea* DC. in DC. Prodr. v. 564 (1836).—As already indicated (*Kew Bull.* 1928, p. 356, sub *Luehea*), the sentence “Letters which are unknown to botanical Latin must be transcribed, diacritic signs are suppressed” seems intended to have the force of a Rule, although it forms part of a Recommendation (IVc). If this view is correct, the “ñ” in *Montañoa* should be replaced by an “n” as above.

**Mundia** *Kunth* in H. B. K. Nov. Gen. v. 392, adnot. 1 (1823). *Mundtia* Harv. in Harv. et Sond. Fl. Cap. i. 95 (1859-60).—Kunth did not supply the derivation of *Mundia*, but the genus was evidently named in honour of the South African collector, Mund, who was a surveyor at Swellendam. There is no justification for the spelling *Mundtia*; the name of the collector appears as “Mund” on the labels of his herbarium specimens (e.g., *Lithospermum scabrum* Thunb.), and he signed himself “L. Mund” in two letters addressed

in 1827 and 1829 to W. J. Hooker (Hook. Corresp. lviii. 208, 210). Ecklon and Zeyher described *Polygala Mundiana* from "Herb. Mund."

**Najas** L. Sp. ed. 1, 1015 (1753); Gen. Pl. ed. 5, 445 (1754). *Naias* Juss. Gen. 19 (1789).—Linné seems to have consistently employed the form *Najas*, so that there is no justification under the International Rules for using the philologically preferable spelling *Naias*.

**Nemastylis** Nutt. in Trans. Am. Phil. Soc. v. 157 (1837). *Nemostylis* Herb. in Bot. Mag. sub t. 3779 (1840). *Nemastylus* Baker in Journ. Linn. Soc., Bot. xvi. 74, 102 (1877). *Nematostylis* Baker, Handb. Irid. 243 (1892). *Nemostylus* Dalla Torre et Harms, Gen. Siphonog. 81, n. 1274 (1900), in syn.

**Oenothera** L. Sp. ed. 1, 346 (1753); Gen. Pl. ed. 5, 163 (1754). *Aenothera* Lam. Encycl. iv. 550 (1797). *Onothera* St. Lag. in Ann. Soc. Bot. Lyon, xviii. 143 (1893).—St. Lager (l.c.) published a learned paper on the spelling of this generic name, and came to the conclusion that *Onothera* was the philologically correct form. The generic name *Oenothera* L., however, was taken by Linné from Theophrastus, *Historia Plantarum*, ed. Bodaeus, 1172 (1644). Linné rejected the name *Onagra*, which had been adopted by Tournefort for this genus, on the ground that it was the name of an animal: "Oenothera nomen est Theophrasti, Lysimachiarum siliquosarum, ut creditur, synonymon, quod huic generi proprium volo; quid Botanicis cum Asinis vel Onagris? quid animalia hybrida pro nominibus plantarum" (Hort. Cliff. 144). It is therefore clear that he would equally have rejected the name *Onothera*, meaning "wild ass." Linné derived *Oenothera* from *οἶνος*, wine and *θήρα*, so that there is no doubt that that spelling was deliberately chosen by him.

**Paradaniellia** Rolfe in Kew Bull. 1912, 96. *Paradaniella* Thonner Fl. Pl. Afr. 636 (1915).—See also *Daniellia*.

**Phaius** Lour. Fl. Cochinch. 529 (1790). *Phajus* Lindl. Orch. Gen. et Sp. 126 (1831). *Phaios* Wittst. Etym.-bot. Handwörterb. ed. 2, 677 (1856). *Phaeus* Post et Kuntze, Lexic. Gen. Phan. 429 (1903).—It would have been better had Loureiro chosen either the purely Greek form *Phaios* or the Latin *Phaeus*, but his choice of *Phaius* must stand. There is no justification, either philological or nomenclatural, for the uncouth spelling *Phajus*.

**Pleurostyliia** Wight et Arn. Prodr. 157 (1834). *Pleurostylis* Walp. Rep. i. 526 (1842).—Wight and Arnott were free to give any termination they pleased to their new generic name *Pleurostyliia*, and Walpers was therefore not justified in altering the original spelling (Art. 24).

**Plumeria** L. Sp. ed. 1. 209 (1753); Gen. Pl. ed. 5, 99 (1754). *Plumiera* Adans. Fam. ii. 172 (1763). *Plumieria* Scop. Introduct. 155



(1777).—Linné at first (Gen. Pl. ed. 1, 66 : 1737) adopted Tournefort's name *Plumeria*, but in 1751 (Phil. Bot. 31) he changed it to *Plumieria*, perhaps by accident, since he also used the other form *Plumeria* in the same work (Phil. Bot. 86, 147, 172).

In any case, he reverted to *Plumeria* in 1753-54, and that spelling should therefore be accepted. Incidentally it may be mentioned that the form *Plumeria* is philologically better than *Plumiera* (vide Journ. Bot. 1921, 347).

**Ptaeroxylon** Eckl. et Zeyh. Enum. 54 (1835). *Ptaeroxylum* Post et Kuntze, Lexic. Gen. Phan. 467 (1903).—Although botanists are recommended to latinize the terminations of new generic and other names proposed by them (Art. 7), they are not obliged to do so, and if a Greek termination was chosen when a name was effectively published, it must be retained under Art. 15, 24, and 50 of the International Rules.

**Rhododendron** L. Sp. Pl. ed. 1, 392 (1753); Syst. Nat. ed. 10, 1023 (1759); Sp. Pl. ed. 2, 562 (1762). *Rhododendrum* L. Gen. Pl. ed. 5, 185 (1754); Gen. Pl. ed. 6, 218 (1764).—In this, as in so many other cases, Linné adopted one spelling in Sp. Pl. ed. 1, 2, and Syst. Nat. ed. 10-12, and a different one in Gen. Pl. ed. 5, 6. Art. 7 states that "Scientific names are in Latin for all groups. When taken from another language, a Latin termination is given them, except in cases sanctioned by custom." This might at first sight seem to indicate that *Rhododendrum* was the correct spelling according to the Rules. But in the first place, as pointed out in *Kew Bull.* 1928, p. 339, Art. 7 is not a "rule" but a "guiding principle," and has merely the status of a "recommendation." Such generic names as *Coupoui*, *Manihot* and *Quamoclit* are neither Latin nor latinized, yet they are valid under International Rules. Secondly, many Greek words were taken into Latin without alteration in their terminations, as may be seen in such works as Pliny's *Historia Naturalis* (e.g., *Cirsion*, *Enneaphyllon*, *Leuce*, *Periclymenos*, etc.), so that such terminations may be regarded as being "sanctioned by custom."

The concluding sentence of Art. 5 is applicable to the case of *Rhododendron* versus *Rhododendrum*: "Finally in the absence of a rule, or where the results of a rule are doubtful, established custom becomes law." As the established custom is to use the spelling *Rhododendron*, that is the correct form under International Rules.

**Scottellia** Oliv. in Hook. Ic. Pl. t. 2265 (1893). *Scottelia* Engl. in Engl. et Prantl, Nat. Pflanzenfam., Register zu Teil ii-iv, 389 (1899).—"The generic name is contrived to commemorate as euphionously as possible the important botanical services of my friend Mr. G. F. Scott-Elliot" (Oliv. l.c.). *Scottellia* being an arbitrarily formed generic name must be retained with its original spelling. The fact that the name of the collector was "Scott-Elliot" (with one "l") is immaterial. Even had Oliver been aware

of this, he might quite well have doubled the "1" in order to obtain a *euphonious* generic name preserving as far as possible the *sound* of the collector's name, just as Ruel was latinized as Ruellius and commemorated in *Ruellia*.

**Sideroxylon** L. Sp. Pl. 192 (1753). *Sideroxylum* L. Gen. Pl. ed. 5, 89 (1754).—Linné (Gen. Pl. ed. 1, 58: 1737) took up the generic name *Sideroxylum* from Dillenius (Hort. Elth. 357, t. 265: 1732), who traced it back to *Sideroxylum Africanum seu Lignum ferrea duritie folio oblongo* Hermann, Parad. Bat. Prodr. 375 (1689). Linné adopted the spelling *Sideroxylum* in the successive editions of his Genera Plantarum (1737-64). In Hort. Cliff. 69 (1737) he used *Sideroxylon* as the generic heading, but named his two species *Sideroxylum inerme* and *Sideroxylum spinosum* respectively. In Sp. Pl. ed. 1 and 2 (1753-63), and Syst. Nat. ed. 10-12 (1759-68) he adopted *Sideroxylon*.

In the circumstances, *general usage* should be followed, and as *Sideroxylon* has been adopted in Endl. Gen. Pl., Benth. et Hook. f. Gen. Pl., Engl. et Prantl, Nat. Pflanzenfam., and Dalla Torre et Harms, Gen. Siphonog., it should be accepted as the correct spelling.

(1) **Toxicodendron** Mill. Gard. Dict. Abridg. ed. 4 (1754). *Toxicodendrum* Moench, Meth. 73 (1794).—Anacardiaceae.

(2) **Toxicodendrum** Thunb. in Vet. Akad. Nya Handl. Stockholm, xvii. 188, t. 7 (1796). *Toxicodendron* Spreng. Anleit. ed. 2, ii. 367 (1817).—Euphorbiaceae. The existence of the valid prior homonym *Toxicodendron* Mill. automatically invalidates *Toxicodendrum* Thunb., whether the former is accepted as the name of an independent genus or not (Art. 51, 56). As a matter of fact, *Toxicodendron* Mill. is currently treated by some botanists as generically distinct from *Rhus* L. (e.g., in Britton and Brown, Ill. Fl. ed. 2, ii. 483: 1913), but in any case *Toxicodendrum* Thunb. should be replaced by *Hyaenanche* Lamb. (1797) under the International Rules of Nomenclature. It is unfortunate that this fact should have been overlooked by Pax and K. Hoffmann when they dealt with the genus in Engl. Pflanzenreich (iv. 147, xv), Euphorbiaceae-Phyllanthaeae, 284 (1922).

**Weigela** Thunb. in Vet. Akad. Handl. Stockh. 1780, 137, t. 5. *Weigelia* Schreb. Gen. i. 113 (1789).—Although the amended form *Weigelia* is in accordance with Rec. IVb of the International Rules, nevertheless the original spelling adopted by Thunberg must be retained under Art. 24.

**Ziziphus** Mill. Gard. Dict. Abridg. ed. 4 (1754); Boehm. in Ludw. Gen. ed. 3, 280 (1760). *Zizyphus* Adans. Fam. ii. 304 (1763). *Ziziphon* St. Lager in Ann. Soc. Bot. Lyon, vii. 70 (1880). *Zizyphon* St. Lager, l.c. 137.—The generic name appeared in the form *Ziziphus* in Pliny, Hist. Nat. lib. 12, cap. 23, ed. Alexander Benedictus, 94 (1507), ed. Harduin. i. 671, l. 26 (1723); also in Columella,

De re rustica, lib. 9, cap. 4, ed. Angelius, fol. 199, verso (1515), ed. Petrus Victorius, 317 (1541); and in Palladius, De re rustica, lib. 5 (Aprilis), cap. 4, ed. Angelius fol. 306, verso (1515). Dodoens, Pempt. 794 (1583), adopted *Zizyphus* in the text, but had the spelling *Ziziphus* above the figures. Clusius, Rar. Pl. Hist. i. 28 (1601), adopted *Ziziphus*. Caspar Bauhin, Pinax, 446 (1623), also chose the form *Ziziphus*, and so did Tournefort, Élem. i. 497, t. 403 (1694), Inst. i. 627 (1700), and Ruppianus, Fl. Jen. 122 (1718), ed. Haller, 136 (1745). On the other hand Bodaeus, in his edition of Theophrastus, Hist. Pl. 329 (1644), preferred the spelling *Zizyphus*, which was also adopted by Ray, Hist. Pl. ii. 1533 (1688).

Miller chose the time-honoured spelling *Ziziphus*, and his choice is final under the Rules. There can be no question of an orthographic error on his part. The spelling "zizyphus" appears to be more correct philologically, according to Lewis and Short, Latin Dictionary, 2018 (1927), but it is not permissible under the Rules to make orthographic corrections based *solely* on philological grounds (vide *Kew Bull.* 1928, 340).

## IX.—*DAHLIA CORONATA* HORT. T. A. SPRAGUE.

A new *Dahlia* from Mexico, with slightly honey-scented flowers, was offered for sale under the name *Dahlia coronata* in January, 1908, by various Continental nurserymen, and brief notices of it appeared in Oesterreichische Garten-Zeitung, Jan. 1908, p. 19, Le Jardin, 5 Févr. 1908, p. 44, Gardeners' Chronicle, April 4, 1908, p. 218, and April 11, p. 237, Journal of Horticulture, May 7, 1908, p. 425, and Gartenflora, Nov. 1908, p. 595.

The following short account was given in *Kew Bull.* 1909, App. III, p. 88, accompanied by references to the periodicals mentioned above:

"A slender-growing plant 4-5 ft. high. Peduncles  $1\frac{3}{4}$ - $2\frac{1}{2}$  ft. long. Flower-heads orange-scarlet, sweet-scented, ray-florets slightly curved inwards."

An illustrated account of *Dahlia coronata* appeared in Le Jardin, 5 December 1910, in which it was stated that the plant came true from seed, and that it had been identified at Kew as a form of *D. coccinea* Cav. Comparison with the original and other descriptions and figures and with herbarium specimens of that species, however, shows that it differs in several respects.

The following are the important characters:—

*D. coccinea* Cav. Outer involuclral bracts reflexed; capitulum obovoid or obovoid-globose in bud. Leaves bipinnate, biternate or simply pinnate, appressed pilose on the upper surface, distinctly pilose on the nerves beneath.

*D. coronata* Hort. Outer involuclral bracts appressed in bud, then spreading; capitulum subcylindric in bud. Leaves biternate or simply pinnate, glabrous on the upper surface—apart from a few

minute hairs on the nerves—indistinctly and sparingly pilose on the nerves beneath.

In view of these differences it seems desirable for the present to retain the name *Dahlia coronata* for the plant under discussion, although it is undoubtedly closely related to *D. coccinea*. A revision of the genus *Dahlia* is long overdue, but it should be pointed out that a satisfactory knowledge of the different species can only be obtained by studying the numerous forms in their native countries. Herbarium specimens of *Dahlia*, though indispensable for taxonomic purposes, do not preserve all the diagnostic characters required, and only a small proportion of the wild forms is in cultivation. When a more complete series is known, it is possible that *D. coccinea* and *D. coronata* may be found to be linked by a chain of intermediate forms, but in the absence of evidence to that effect, it is better, at present, to treat them as independent species.

The following short description, and a more complete one in Latin, have been drawn up from material communicated for the purpose by the John Innes Horticultural Institution, Merton.

***Dahlia coronata*.** *Stem* finely striate, glaucous. *Leaves* simply pinnate and 5-foliolate, or biternate; leaflets ovate-oblong, the terminal one elliptic, sessile or subsessile in the pinnate leaves, shortly petiolulate in the biternate ones, the terminal leaflet long-petiolulate, irregularly serrate, with a narrow hyaline finely serrulate margin, glabrous on the upper surface except for a few minute hairs on the nerves, sparingly pilose with longish hairs on the nerves of the lower surface. *Peduncles* 20–35 cm. long, glandular in their upper part. *Capitula* subcylindric shortly before expansion, about 1 cm. long, and rather more in diameter. *Involucre* double, consisting of 5 outer bracts composing the involucre proper, and 8 inner bracts which subtend the ray-flowers; outer bracts appressed in the bud, then spreading, very broadly ovate, very shortly petioled, 9–11-ribbed; inner bracts lanceolate-oblong, obtuse, lower half erect, upper half spreading. *Ray-flowers* 8, without styles, but with large ovules. *Corolla-limb* about 3 cm. long and 2 cm. broad, minutely glandular-pilose beneath. *Fruiting capitulum* ovoid, the inner bracts appressed, accrescent, finally about 2.5 cm. long.

***Dahlia coronata Hort.*** *Caulis* fistularis, subtiliter striata, glauca, superne purpureo-tincta, internodiis duobus superioribus 15–17 cm. longis. *Folia* alia biternata, alia pinnata. *Folia biternata* majora 18–19 cm. longa; petioli 5–6.5 cm. longi, profunde sulcati, linea elevata carnosae basi conjuncti, linea elevata saepe medio purpurea ibidemque fasciculo pilorum instructa, ut petiolorum bases pilis longis debilibus glanduloso-capitatis sparse ciliata; rhachis 5.5–7 cm. longa, profunde sulcata, nodis ejus valde pilosis; petioli secundarii 4–4.5 cm. longi, pilis parvis glanduloso-capitatis sparsissime ciliati subtus pilis similibus numerosioribus; petioluli foliolorum lateralium 0.5–1.5 cm. longi, terminalium 3 cm. longi;

foliola ovato-oblonga vel terminalia elliptica, terminalia circiter 4·5 cm. longa, 3-3·5 cm. lata, cetera multo minora, irregulariter serrata margine hyalino serrulato denticulis glanduloso-capitatis, supra opaca (sub lente valida papillata et paullulum lucidula), nervis venulisque leviter impressis, nervo medio et lateralibus minute pilosa, ceterum glabra, subtus nervo medio valde prominente lateralibus leviter elevatis, nervo medio pilis longiusculis sparse induto, nervis lateralibus et rete venularum pilis minoribus instructis; folia biternata minora 11-13 cm. longa, petiolis 3-4 cm. longis, rhachibus 4·5-5 cm. longis, petiolis secundariis 1·2-1·5 cm. longis bifoliolatis, petiolulo terminali 1·5 cm. longo, foliolo terminali 3·5 cm. longo, 2·5 cm. lato. *Folia pinnata* circiter 8 cm. longa, 5-foliolata, foliolis lateralibus superioribus sessilibus, inferioribus subsessilibus vel breviter (ad 5 mm.) petiolulatis, foliolo terminali circiter 5·5 cm. longo et 2·5 cm. lato. *Pedunculi* capitulorum terminalium 20-35 cm. longi, versus apicem glandulosi, ei lateralium multo breviores. *Capitula* paullulum ante apertionem breviter subcylindrica, 1 cm. longa et 1·2 cm. diametro. *Involucrum* duplex, exterius involucrum verum, interius e bracteis propriis florum radii compositum. *Phylli exteriores* 5, in alabastro appressi, demum patentes, latissime ovati, 7 mm. longi, 8-9 mm. lati, brevissime petiolati, 9-11-costati, atro-virides, perlucidi, extra minute glandulosi praesertim inferne, superne punctis parvis elevatis (basibus persistentibus glandularum) notati. *Phylli interiores* 8, lanceolato-oblongi, obtusi, 1·6-1·8 cm. longi, 0·8-0·9 cm. lati, dimidio inferiore erecto, dimidio superiore patente, straminei, membranacei. *Flores radii* 8, stylo nullo sed ovulo magno. *Ovarium* 1·5 mm. longum, 1·8 mm. latum, valde applanatum, marginibus minute crispule pilosis. *Corollae limbus* circiter 3 cm. longus, 1·8-2 cm. latus, aurantiacus, circiter 15-nervis, subtus minute glanduloso-pilosus, praesertim in nervis, nervis plus minusve elevatis; tubus plano-convexus, superficie exteriori in triente superiore densiuscule ceterum sparse glanduloso-pilosa, superficie interiore densiuscule glanduloso-pilosa. *Paleae* (seu bracteae propriae florum disci) ovato-oblongae, 9-10 mm. longae, 4·5-5 mm. latae, subtruncatae, superne minute eroso-dentatae. *Flores disci*: *Corollae tubus* parte inferiore albida 2·5-3 mm. longa, parte superiore lutea 4·5-5·5 mm. longa, lobis circiter 1 mm. longis. *Stylus* circiter 3 mm. e tubo exsertus, ramis 5 mm. longis inferne 1 mm. non-stigmaticis, ceterum stigmaticis. *Capitulum fructiferum* ovoideum bracteis involucri exterioribus patentibus, bracteis interioribus accrescentibus, tandem 2·5 cm. longis.

## **X.—LAGOSERIS MARSCH.-BIEB. AND LAGOSERIS HOFFMGG. & LINK. M. L. GREEN.**

Many of the difficulties which arise in nomenclature are due to the existence of homonyms, that is to say identical names given independently to different plants. During the preparation of the

Seventh Supplement to the *Index Kewensis*, now in the Press, several cases have been found of names which are currently used for two or even three different genera ; thus the name *Alsine* has been employed during the period 1921-1925 for the three genera correctly known as *Minuartia* L., *Spergularia* J. & C. Presl, and *Stellaria* L. Also two genera are included under the name *Bassia*, one to which the name is correctly applied belonging to *Chenopodiaceae*, and the other to *Sapotaceae*. At the time of compilation of the original *Index*, published 1893-1895, it was not practicable in all cases to distinguish homonyms when they occurred within the same family, so that it occasionally happens that two different genera are included under the one generic heading. Such is the case with *Lagoseris*. Many of the species included in the *Index Kewensis* and Supplements I-VI. under *Lagoseris* Hoffm. & Link belong to *Lagoseris* Marsch.-Bieb., the generic reference to which is altogether omitted, and many to *Lagoseris* Hoffm. & Link, which are now reduced either to *Crepis* or *Barkhausia*. Pfeiffer had previously confused the two genera and likewise had only one series of references. A similar error has also been made in Dalla Torre & Harms, Gen. Siphonog., p. 579 (1906), where *Lagoseris* Hoffm. & Link is cited erroneously as a synonym of *Pterotheca*, as well as in its correct position under *Crepis*.

It is considered advisable to re-insert all the species already in the *Index Kewensis* in the current supplement under their proper generic heading. Detailed synonymy of the two genera is therefore appended.

**Lagoseris** Marsch.-Bieb. Cent. Pl. Rar. Taur. Cauc. t. 30 (1810) ; Fl. Taur. Cauc. iii. 538 (1819) ; Cass. in Dict. Sc. Nat. xxv. 124 (1822) ; Spreng. Syst. iii. 637 (1826) ; Less. Syn. 139 (1832) ; Koch, Syn. ed. 1, 435 (1837) ; Endl. Gen. 500 (1838) ; Walp. Rep. ii. 697 (1843) ; Griseb. Spicil. Fl. Rumel. ii. 276 (1844) ; Nym. Syll. 50 (1854-55) ; Boiss. Fl. Or. iii. 882 (1875) ; Nym. Consp. 460 (1878-82) ; Post & Kuntze, Lexic. Gen. Phan. 314 (1903).

Type species : *Lagoseris crepoides* Marsch.-Bieb. (*Hieracium purpureum* Willd.).

*Pterotheca* Cass. in Bull. Soc. Philom. 1816, p. 200 ; et l.c. 1821, p. 125 ; Cass. in Dict. Sc. Nat. xxv. 62 (1822), xlv. 56 (1826), xlviii. 422 (1827), lx. 568 (1830) ; DC. Prodr. vii. 179 (1838) ; Ledeb. Fl. Ross. ii. 831 (1846) ; Gren. & Godr. Fl. France, ii. 329 (1850) ; Benth. & Hook. f. Gen. Pl. ii. 516 (1873) ; O. Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. iv. Abt. 5, 368 (1893) ; Koch, Syn. ed. 3, ii. 1650 (anno?) ; Fiori & Paoletti, Fl. Ital. iii. 427 (1904) ; Rouy, Fl. France, viii. 209 (1905) ; Dalla Torre & Harms, Gen. Siphonog. 579 (1906).

Type-species : *Pterotheca nemausensis* Cass. (*Crepis nemausensis* Gouan).

*Intybellia* Cass. in Bull. Soc. Philom. 1821, p. 124 ; Cass. in Dict. Sc. Nat. xxiii. 547 (1822) ; Less. Syn. 144 (1832) ; DC. Prodr. vii. 180

(1838) ; Ledeb. Fl. Ross. ii. 831 (1846) ; Brongn. Enum. Gen. Pl. ed. 2, 82 (1850).

The following is a list of names published under *Lagoseris* Marsch.-Bieb. :—*L. alata* Nym., *L. aralensis* Boiss., *L. bifida* Koch, *L. caspica* Paczosky, *L. crepoides* Marsch.-Bieb., *L. frigida* Boiss., *L. hieracioides* Boiss. & Hausskn., *L. Marschalliana* Thellung, *L. nemausensis* Marsch.-Bieb., *L. orientalis* Boiss., *L. purpurea* Stev. ex DC., *L. runcinata* Boiss., *L. Ruppelii* Sch.-Bip., *L. sancta* Maly, *L. taurica* Marsch.-Bieb.

**Lagoseris** Hoffmgg. & Link, Fl. Port. ii. 149 (1820) ; Link, Enum. ii. 289 (1822) ; Reichb. Ic. Bot. i. 11, 28 (1823) ; Link, Handb. i. 797 (1829).

Type-species : *Lagoseris intybacea* Hoffmgg. & Link (*Crepis intybacea* Brot.).

The following are the published binominals :—*L. apargioides* Link, *L. bursifolia* Link, *L. calycina* Hoffmgg. & Link, *L. cernua* Link, *L. intybacea* Hoffmgg. & Link, *L. leontodontoides* Link, *L. raphanifolia* Link, *L. taraxacifolia* Steud., *L. taraxacoides* Reichb., *L. taurinensis* Link, *L. tenuifolia* Reichb., *L. versicolor* Fisch. ex Link.

## XI.—NEW SPECIES OF AND CRITICAL NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA.

N. E. BROWN.

### **Dorotheanthus** Schwant.

By the courtesy of Dr. Briquet I have had the privilege of examining the type of *Mesembryanthemum bellidiforme*, and find that this plant belongs to the genus *Dorotheanthus*. The specimen is a good one and in an excellent state of preservation, although collected so long ago as 22 October 1695. It is not in fruit, but the structure of the ovary, which can be well seen, is unmistakably that of the genus *Dorotheanthus* Schwant., and not of the very similar genus *Cleretum* N. E. Br. Its synonymy will therefore be as follows :

**Dorotheanthus bellidiformis** N. E. Br. (*Mesembryanthemum bellidiforme* Burm. *M. criniflorum* L.f. *Dorotheanthus criniflorus* Schwant. *Stigmatocarpum caducum* L. Bolus and *S. copticum* L. Bolus, but not *Mesembryanthemum caducum* Ait., nor *M. copticum* L., on which those names are founded).

**Echinus** L. Bolus (*Braunsia* Schwantes in Gartenwelt, 1928, 644).

In Flowering Plants of South Africa, at t. 266, this genus was established with much confusion of nomenclature upon a plant that was found to have stiff hairs or processes upon its seeds, while a closely allied species (*E. Maximiliani*) that had no such hairs upon its seeds, but otherwise identical in structure, was placed in the genus *Mesembryanthemum*. The presence or absence of these hairs upon

the seeds is of no more generic importance than their presence or absence upon leaves of different species of the same genus. For example, these stiff hairs are present also on the seeds of some species of *Glottiphyllum* and of *Anacampseros* and are absent from others of the same genera.

The name is unfortunate, as *Echinus* is also the generic name of the common European "Sea-urchin," but retaining this generic name, as there are other characters beside that of the seeds, the species will be as follows :—

**Echinus edentulus** N. E. Br. (*M. edentulum* Haw. *M. apiculatum* Kensit. *M. binum* N. E. Br. *Echinus apiculatus* L. Bol. *Braunsia bina* Schwantes).

**Echinus Matthewsii** N. E. Br. (*M. Mathewsii* L. Bol.).

**Echinus Maximiliani** N. E. Br. (*M. Maximiliani* Schlechter. *M. apiculatum* var. *muticum* L. Bol. *M. Phillipsii* L. Bol. *M. binum* L. Bol., not of N. E. Br. *Braunsia Maximiliani* Schwantes).

**Glottiphyllum propinquum** N. E. Br., sp. nov.

*Folia* disticha, linguiformia, recta vel leviter decurva, 4-7.5 cm. longa, 15-20 mm. lata, 6 mm. crassa, supra usque ad apicem plana, dorso convexa, apice rotundata, pallide viridia. *Pedicelli* 6-10 mm. longi, cultu ad 25 mm. longi. *Calyx* 4-6-lobus, lobi 6-10 mm. longi, 6-8 mm. lati, alii carinati et acuti, alii plani et membranaceo-marginati. *Corolla* circa 5 cm. diametro; petala 1-2-seriata, 20-25 mm. longa et 1.5 mm. lata, apice obtusa vel leviter dentata, lutea. *Stamina* 8 mm. longa, lutea. *Stigmata* 12-14, radiata, 3 mm. longa, plumosa. *Capsula* clausa 12 mm. diametro, leviter convexa, jugis 12-14 onusta.

SOUTH AFRICA. Mossel Bay Division: region of Great Brak River, Mrs. D. van der Bijl 32.

**Lithops Maughani** N. E. Br., sp. nov.

*Corpuscula* 10-15 mm. longa, 10-14 mm. lata et 6-10 mm. crassa, cum fissura 2-4 mm. alta; lobi leviter convexi, cupreo-brunnei, ochraceo-marginati et disco ochraceo-maculati, cum ordine maculorum rubro-brunneorum circa marginem dispositi. *Flores* ignoti. *Capsula* compressa, 4-6 mm. lata, valvis quinque.

LITTLE NAMAQUALAND. Dr. Maughan Brown 708.

A small and neat species, quite distinct from all others known to me.

**Mentocalyx velutina** N. E. Br., comb. nov. (*M. Muirii* N. E. Br. *Mesembryanthemum velutinum* L. Bol. *Gibbaeum velutinum* Schwantes).

The specific name of this plant has to be changed, as I find that it had been previously published as *Mesembryanthemum velutinum*, but I failed to identify it with the description.



**Mesembryanthemum biforme** N. E. Br., sp. nov.

*Planta* ramosa-caespitosa, vix 2·5 cm. alta, glabra. *Folia* sublibera 2–7 mm. longa, 2–3 mm. lata et 2–2·5 mm. crassa, trigona, acuta vel subacuta; folia altera in corpusculum 2–5 mm. longum apice breviter bilobum connata, omnia griseo-viridia purpureo tincta et conspicue punctata. *Pedunculi* 3–4 mm. longi, apice bibracteati. *Bractee* in cupulam bilobam connatae. *Flores* imperfecti, in bracteas subsessiles. *Capsula* clausa 4–5 mm. diametro.

SOUTH AFRICA. Swellendam Division; near Barrydale, Muir.

**Mesembryanthemum brevicolle** N. E. Br., sp. nov.

*Planta* ramoso-caespitosa vix pollicem alta, glabra. *Folia* sublibera 4–6 mm. longa, 1·5–2 mm. lata et crassa, supra plana, acuta, subtus acute carinata, lateribus convexa; folia altera ad medium connata, omnia pallide glauco-viridia, obscure punctata. *Pedunculi* brevissimi, bibracteati. *Pedicelli* 2 mm. longi. *Corolla* circa 12 mm. diametro; petala subbiseriata, circa 5 mm. longa, 0·5 mm. lata, acuta, rosea, linea saturate rosea notata. *Staminodia* et *stamina* basi alba et apice rosea vel raro omnino alba. *Stigmata* 5, subulata. *Ovarium* circa stigmata 5-tuberculatum.

SOUTH AFRICA. Ladismith Division; Klein Karoo, flowering in July, Muir 4064.

**Mesembryanthemum condensum** N. E. Br., sp. nov.

*Planta* et folia eis *M. propinqui* simillima, sed foliis 6–8 mm. longis eciliatis et floribus bibracteatis differt.

*Flores* sessiles vel pedunculis infra bracteas 2–3 mm. longis. *Corolla* circa 10 mm. diametro; petala 4 mm. longa, acuta, rosea, linea saturate rosea notata. *Stamina* ad apicem rosea, basi albida. *Glandulae* in annulum pentagonum conjunctae. *Stigmata* 5, fere 2 mm. longa, basi tuberculis magnis cincta.

SOUTH AFRICA. Montagu Division; Klein Karoo, Muir 4065.

**Mesembryanthemum Ivori** N. E. Br., sp. nov.

*Planta* caespitosa, circa 2–2·5 cm. alta, glabra. *Folia* biformia, foliis marcidis vestita; folia sublibera 4 mm. longa, hemispherica, quum clausa corpusculum globosum 3 mm. diametro formata; folia altera fere ad apicem in corpusculum ellipsoideum connata, omnia viridia, punctata. *Flores* solitarii. *Pedicelli* foliis breviores, fructu 3–4 mm. longi. *Calyx* subaequaliter 6-lobus; lobi 3 mm. longi, ovati, obtusi vel subacuti. *Corolla* specie 10–12 mm. diametro. petala uniseriata, 4–5 mm. longa, anguste linearia, obtusa, pulchre purpurea. *Stamina* 2 mm. longa, alba. *Stigmata* 6, erecta, 1 mm. longa, subulata, acuta.

SOUTH AFRICA. Frazerburg Division; Karoo near Frazerburg, Dekenah 67, and in *Herb. Muir* 4285.

Named after the discoverer, Mr. Ivor Dekenah.

**Mesembryanthemum Dekenahi** N. E. Br., sp. nov.

*Planta* 2–2·5 cm. alta, glabra. *Folia* omnia conformia, juniora clausa, 4–12 mm. longa, 1·5–3·5 mm. lata et 2·5–3·5 mm. crassa,

trigona, acuta, supra plana, dorso carinata, glauca, punctis atroviridibus notata. *Pedicelli* 4–10 mm. longi, interdum basi bracteati. *Calycis* lobi 2·5–3 mm. longi, ovati, obtusi. *Corolla* circa 12 mm. diametro, roseo-purpurea. *Staminodia* et *stamina* circa 1·5 mm. longa, albida. *Stigmata* 5, circa 1·5 mm. longa. *Capsula* expansa 4–5 mm. diametro.

SOUTH AFRICA. Frazerburg Division; Frazerburg Karoo, *Dekenah* 23, and in *Herb. Muir* 4079.

This attractive little species was also discovered and sent to me by Mr. Ivor Dekenah.

**Mesembryanthemum disgregum** *N. E. Br.* This is the plant wrongly described and figured as being *M. stipulaceum* L. in *Fl. Pl. of S. Africa*, t. 253. It is a dwarf shrublet with decumbent stems or main branches and not glaucous, while *M. stipulaceum* is a tall, erect, shrubby species, very glaucous, and with different flowers.

**Mesembryanthemum limbatum** *N. E. Br.*, sp. nov.

*Caespitosa*, 2–3 cm. alta. *Folia* basi connata, 5–10 mm. longa, 5–7 mm. lata et 4–5 mm. crassa, trigono-ovata, dorso carinata, cinereo-viridia, marginibus et carinis brunneis, impunctata. *Pedicelli* brevissimi. *Corolla* 14–16 mm. diametro, petala linearia, obtusa vel subdentata, purpurea. *Staminodia* et *stamina* purpurascens, basi pallida, antheris albis.

SOUTH AFRICA. Saldanha Bay district, *Marloth*.

This charming little plant, for which I am indebted to Dr. R. Marloth, is one of a group of very dwarf tufted or mat-forming species, that look very different from the taller shrubby kinds, but I find no character in their flowers or fruit to separate them from *Mesembryanthemum*. In some species the leaves are all alike, but in others the alternating pairs are dissimilar, those of one pair being free nearly to the base and those of the next pair united for half to three-parts or more of their length into a solid body, which sometimes withers into a whitish sheath enclosing the succeeding pair. But these distinctions, I find, from the numerous species I have examined, gradually pass into one another, and by other transitions into the taller shrubby species so that they cannot be generically separated.

**Mesembryanthemum propinquum** *N. E. Br.*, sp. nov.

*Planta* vix pollicem alta. *Folia* sublibera 5–6 mm. longa, 2·5–3 mm. lata et 2 mm. crassa, supra plana, dorso rotundata et leviter carinata; folia connata dorso acute carinata, omnia marginibus carinisque minute ciliata, leviter glauco-viridia. *Flores* subsessiles vel infra bracteas pedunculo 3–4 mm. longo suffulti, quadribacteati. *Corolla* 8–10 mm. diametro; petala uniseriata, obtusa, pallide rosea, linea saturate rosea notata. *Capsula* clausa 4–5 mm. diametro.

SOUTH AFRICA. Montagu Division; in the Klein Karoo, *Muir* 4071.

**Mesembryanthemum roseolum** *N. E. Br.*, sp. nov.

*Folia* sublibera 6–8 mm. longa, basi 3 mm. lata et 2.5 mm. crassa, ad apicem obtusum attenuata, supra plana vel leviter convexa, subtus rotundata et leviter carinata; folia altera medium connata, omnia glauco-viridia, pellucido-punctata. *Pedicelli* 3–4 mm. longi, basi bibracteati. *Corolla* circa 15 mm. diametro, odorata; petala laxa, 5 mm. longa, vix 1 mm. lata, acuta, pallide rosea. *Staminodia* et *stamina* albida, apice rosea. *Glandulae* in annulum pentagonum connatae. *Stigmata* 1.5 mm. longa, subulata, luteola.

SOUTH AFRICA. Montagu Division; Klein Karoo, *Muir* 4062.

**Mesembryanthemum sobrinum** *N. E. Br.*, sp. nov.

*Planta* ramosa-caespitosa vix pollicem alta, glabra. *Folia* sublibera 3–5 mm. longa, 2 mm. lata et 1.5 mm. crassa, supra plana, subtus leviter compressa et carinata, carina leviter scabra; folia altera ultra medium connata, omnia subglauco-viridia. *Pedicelli* 2–3 mm. longi, sed in vaginam foliorum partim inclusi. *Corolla* circa 8 mm. diametro; petala 3–4 mm. longa, acuta, roseo-purpurea, linea saturate purpurea notata. *Staminodia* et *stamina* roseo-purpurea basi alba. *Glandulae* distinctae. *Stigmata* 5, filiformia, 1.5 mm. longa.

SOUTH AFRICA. Riversdale Division; Klein Karoo, *Muir* 4014.

**Psilocaulon distinctum** *N. E. Br.*, sp. nov.

*Frutex* erecta ad 45 cm. alta. *Rami* saepe oppositi, 3–4 mm. crassi, internodiis 5–20 mm. longis et papulis compressis prominentibus dense obtecti. *Folia* 5–10 mm. longa, 1–1.5 mm. crassa, incurvato-erecta, semiteretia, obtusa, supra canaliculata, minute papulosa. *Flores* ad apicem ramorum subcymosi. *Pedicelli* 2–3 mm. longi. *Calyx* minute papulosus, inaequaliter 4-lobus; lobi 5–6 mm. longi, duobus interioribus membranaceo-marginatus. *Corolla* 10–12 mm. diametro, alba.

GREAT NAMAQUALAND. Keiap Ravine, Great Karasberg, *Pearson* 8591.

**Psilocaulon implexum** *N. E. Br.*, sp. nov.

*Rami* prostrati ad 2 mm. crassi, implexi, junioribus glaucis. *Folia* incurvato-adscendentia, 6–10 mm. longa, 1.5 mm. crassa, subteretia, acuta, basi angustata, supra canaliculata, pellucido-punctata, glauca. *Flores* in ramulos brevissimos laterales secus rami dispositi. *Pedicelli* circa 2 mm. longi, erecti. *Calyx* inaequaliter 4-lobus, glaucus. *Petala* 4 mm. longa, 0.5 mm. lata, linearia, acuta, alba. *Stigmata* 4, erecta, 2 mm. longa, pallide luteola.

SOUTH AFRICA. Riversdale Division; by the Kafirkuiis River. *Muir* 4234.

This is allied to *P. parviflorum* L. Bol., but is readily distinguished by its much more slender stems and shorter pedicels, which much less abruptly pass into the calyx.

• **Erepsia Marlothii** N. E. Br., sp. nov.

*Caules* plures e radice, erecti, graciles, 15–22 cm. alti et ad 1 mm. crassi, internodiis 1–5 cm. longis, glabri, ochracei, punctis linearibus brunneis crebre notati. *Folia* suberecta, 5–10 mm. longa, 1 mm. crassa, lineari-trigona, acuta, punctata. *Flores* ad caulem 1–3, subsessiles vel pedicellis ad 2 mm. longis, quisque bibracteati vel quadribacteati. *Bractee* 4 mm. longae, late ovatae, acutae. *Corolla* specie 2–2.5 cm. diametro; petala subuniseriata, laxa, circa 10 mm. longa et 0.75 mm. lata, linearia, obtusa, specie rosea vel roseo-purpurea. *Staminodia* 1.5–3 mm. longa, apice recurva, specie aurantiaca apice atro-purpurea. *Stamina* alba. *Stigmata* minuta, virescens.

SOUTH AFRICA. Clanwilliam Division; Cedarberg Range, 1000 ft. alt., *Primos* in *Herb. Marloth* 13537.

**Roodia brevipes** L. Bol. (*R. digitifolia* N. E. Br. *Mesembryanthemum brevipes* Schlecht.). I have now been able to examine the type of *M. brevipes*, Schlechter no. 8147, from hills on Knechts Vlagte near Zout River, and find that Mrs. Bolus is quite right in stating that this plant is a *Roodia*. But Schlechter's description of it is erroneous, so that it would be impossible to identify the plant without seeing the type. The statements that there are 4–6 leaves to a growth and that the flowers have 6 subulate stigmas are wrong, the leaves and structure being as described by myself for *Roodia*. The subulate stigmas are imaginary, for there is only the one circular sessile stigma in the type, which has no visible peduncle, the bracts being only just exerted from between the leaves, and the pedicel is only 10–12 mm. long. But from photographs of this plant that I have now seen, I find the length of the peduncle and pedicel to be a very variable character, and am now satisfied that *M. brevipes* Schlecht. and *Roodia digitifolia* are one species.

**Vanzijlia** L. Bol.

This genus was published in South African Flowering Plants vii. t. 262, where great confusion has been caused by the misidentification of one of the species. At the place quoted, Mrs. Bolus states "I have been able to dissect a flower of the type of *M. annulatum* Berger, and to satisfy myself that *M. angustipetalum* L. Bolus is identical with it." Mrs. Bolus, according to a note on the type sheet, has I believe only had a flower or a very small scrap of *M. annulatum* for examination. I have seen and examined the complete specimen, and find it to be a remarkable plant and different from that which Mrs. Bolus has identified with it. I therefore give here a more complete description of it than has yet been published, together with the synonymy of the two species.

Upper pairs of leaves united for about one-quarter to one-third of their length, acute; petals 18–20 mm. long.....1. *angustipetala*.  
Upper pair of leaves united for half or more than half of their length, obtuse or rounded at the apex; petals apparently not more than 12 mm. long.....2. *annulata*.

1. **Vanzijlia angustipetala** N. E. Br., comb. nov. (*Mesembryanthemum angustipetalum* L. Bol. in Ann. Bol. Herb. iii. 166. *Vanzijlia annulata* L. Bol. in Fl. Pl. of S. Afr. vii. t. 262, not *Mesembryanthemum annulatum* Berger).

2. **Vanzijlia annulata** N. E. Br., comb. nov.

*Glabrous. Main stems* about 15 cm. high, with internodes 4–32 mm. long and about 2 mm. thick, dark grey; lateral branches suberect or upcurved, 8–25 mm. long, each terminating in two dissimilar pairs of leaves and the naked part marked with prominent rings at the closely placed nodes. *Leaves* opposite, 1–2 pairs to each growth, united for the greater part of their length and the pairs dissimilar; the first pair small and, when closed together, forming an ellipsoid or globose body 6–10 mm. long and 6–8 mm. in diameter, afterwards becoming spreading, bearing on their tips a very peculiar rosette or circle of small and apparently hardened excrescences on (or folds of) the epidermis, somewhat suggestive of a structure similar to that of the tuft of bristles at the tips of the leaves of *M. barbatum*, but in this plant they are but mere ridges slightly raised above the surface. From between the first pair arises a second larger and differently shaped pair, 6–16 mm. long at the exerted part, somewhat resembling growths of *Conophytum turrigerum* in form, being united for half or more of their length, with the free parts 5–8 mm. long and 4–5 mm. thick, rounded on the back and obtuse at the apex, and quite destitute of the peculiar rosette present on the tips of the first pair; epidermis smooth, not coarsely papillate as originally described, but of course much wrinkled in the dried state. *Flower* solitary, terminal. *Pedicel* exerted 2–4 mm. from the united part of the leaves, bractless (in the original description the second pair of leaves are mistakenly called bracts). *Calyx* unequally 5-lobed nearly down to its union with the ovary (not 4-lobed, as described); lobes 4–7 mm. long, obtuse or subacute, three of them with membranous margins. *Petals* in 1–2 series, apparently about 10–12 mm. long and less than 1 mm. broad, narrowly linear. *Staminodes* many, about 3–4 mm. long, filiform, acute. *Stamens* 4–5 mm. long. *Stigmas* 10, about 3 mm. long, erect, subulate, united at the base into a very short stout style. *Capsule* unknown.—*Mesembryanthemum annulatum* Berger in Engler, Bot. Jahrb. lviii, 627.

SOUTH AFRICA. Van Rhynsdorp Division; in sandy places on the Karee Bergen, 1500 ft. alt., *Schlechter* 8280.

The above description is made from the type plant, and the measurements given are those of the dried specimen and may be exceeded when the plant is alive. The original description is inaccurate.

## XII.—MISCELLANEOUS NOTES.

JOHN REDMAN BOVELL, I.S.O., F.C.S., F.L.S., whose death occurred at Barbados on November 22nd, 1928, at the age of 73, began his official agricultural career in 1886 as Superintendent of the Botanic Station at Dodd's Reformatory in Barbados, where he had been in charge of the Reformatory and Industrial School since 1883. Here, in conjunction with Prof. Harrison, and later with Prof. D'Albuquerque, he undertook and carried out a very valuable series of cultural experiments to determine the best varieties of canes suitable for Barbados.

On the formation of the Imperial Department of Agriculture with headquarters in Barbados, in 1898, he was seconded from his post of Superintendent of the Reformatory to take charge of the Experiment Station for the improvement of the sugar cane. He was appointed Superintendent of Agriculture in Barbados in 1908, and in the same year was honoured with the I.S.O. He retired in 1925.

Bovell will be best remembered by his prominent association with the discovery of seedling sugar canes. The subject is discussed in the *Kew Bulletin*, 1888—"Seedlings of Sugar Cane at Barbados" (pp. 294-296), and 1891—"Production of seed and seminal variation in the Sugar Cane" (pp. 10-24): whilst in "Nature," February 9th, 1911, the late Sir William Thiselton-Dyer, in a paper on "What Science has done for the West Indies," records that "about 1888, Mr. Bovell and Professor Harrison noticed the spontaneous occurrence of seedling sugar-canes in Barbados. It was found that the sugar-cane did actually produce seed, though in so small a quantity that it had been overlooked. As this at once opened the door to seminal variation and selection the attention of the Colonial Office was at once directed by Kew to the importance of the discovery. The work was vigorously taken up by Sir Daniel Morris and from 1898 onwards seedlings have been raised on a large scale by Mr. Bovell and continuously selected from as well as hybridised." The influence for good of this early work with seedling canes has not been limited to Barbados but has since been felt over the whole of the sugar world.

J. H. H.

**"A Sower."**—This important work by the late Sir Hamo Thornycroft, R.A., has been most generously presented to the Ministry of Agriculture and Fisheries by the President and Council of the Royal Academy, to be placed in the Royal Botanic Gardens, Kew. The statue has been erected at the northern end of the Broad Walk, on a pedestal designed by Sir Edward Lutyens, R.A., and Mr. A. Drury, R.A. It is hoped that a photograph of the statue will appear in a later number of the *Kew Bulletin*.

**The Otari Open Air Museum, Wellington, New Zealand.**—In the *Kew Bulletin*, 1926, p. 428, under the title "A Nature Reserve in Wellington," a brief account was given of the project for the

setting apart of Wilton's Bush, now known as the Otari Open Air Museum, as a reserve for the native vegetation of New Zealand.

On January 25th, 1928, I was present at the formal inauguration of this fine area by the Mayor of Wellington, and had the opportunity of visiting the whole of the reserved area, which is very richly furnished with an almost untouched collection of native plants. As many characteristic New Zealand trees, shrubs and herbaceous plants are not to be found in the old Bush, Dr. Cockayne, to whose keenness and enterprise the initiation of this important scheme is due, has arranged for the planting of as representative a collection of New Zealand plants in this remarkable open air Museum as may be likely to flourish there.

As Alpine plants were hardly represented in the Bush, Dr. Cockayne has selected an area suitable for the construction of an Alpine Garden, and in a recent letter he informs me that the planting of the Alpine Garden has been commenced. Among the plants Dr. Cockayne mentions that there are "at least 100 *Celmisia* hybrids, *Stilbocarpa polaris*, about 12 fine young *Ranunculus insignis*, various hybrid *Hebes* and *Olearias*, *Gunnera Hamiltonii*, some *Gaultherias*, *Phyllachne Colensoi* and *Donata novae-zelandiae*. Much of the soil is a fine open loam. There is abundance of good-sized rocks and any amount of broken rocks for a top-dressing. I think more than 500 plants, representing about 200 species and varieties, are in their places."

"Other work is also in progress. The ground for the systematic collection has been ploughed and we are putting hedges, each about 30 ft. long, round it of various indigenous plants, e.g., *Dodonaea viscosa*, *Metrosideros tomentosa*, various species of *Hoheria*, species of *Coprosma*, etc. At the upper entrance, near the gardener's house, there will be planted a grove of *Edwardsia microphylla*, *Hoheria populnea*, *H. sexstylosa* and *Clanthus puniceus*. In the valley there is being planted a large bed with all the variegated and bronze-leaved trees and shrubs plus the double and single crimson, pink and white forms of *Leptospermum scoparium* and, in another place, 100 shrubs of *L. scoparium* var. *Nichollsii* to form a close mass."

"Then 2½ acres have been ploughed ready for the artificial Kauri forest and the allied forest associations."

"Finally, many plants of *Clematis indivisa* are to be planted so as to climb over the 'natural pergola' through which the main path passes from the lower entrance and the Alpine garden."

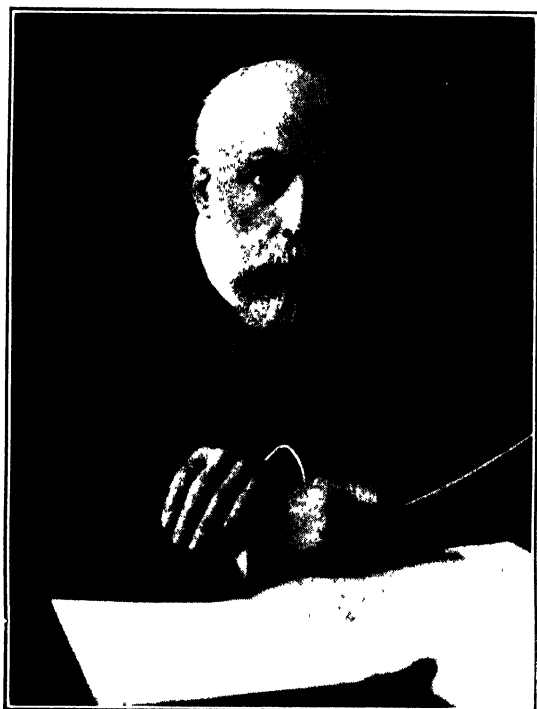
This very interesting Open Air Museum should prove of the greatest interest to all lovers of the remarkable New Zealand vegetation resident in the Dominion and also be of the utmost value to all visitors to New Zealand who wish to study the native plants of the Islands.

A. W. H.





PLATE III



*By permission of "The Field"*

SIR WILLIAM TURNER THISTELTON-DYER,  
K C M G , C I E , 1843-1928

# BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1929 ROYAL BOTANIC GARDENS, KEW

## XIII.—SIR WILLIAM TURNER THISELTON-DYER, 1843-1928.

Kew mourns the loss of her third Director, Sir William Turner Thiselton-Dyer, K.C.M.G., C.I.E., whose death, on December 23rd, 1928,\* has already been recorded in these pages.

The year 1875 marked the commencement of Thiselton-Dyer's official connection with the Royal Botanic Gardens, for in that year the post of Assistant Director, which had been in abeyance for ten years, was revived, and he was invited by the Director, Dr. J. D. Hooker, to take up the position. The choice was a fortunate one, and showed that Hooker had already, from the new line in botanical study and teaching which Dyer had initiated, singled him out as a man likely to make his mark in the botanical world. He had also had the opportunity of testing his ability for the post, as for a time Dyer gave him some help as private secretary.

Thiselton-Dyer was Assistant Director for ten years, and succeeded Sir Joseph as Director in 1885. For the next twenty years, until his retirement on December 15th, 1905 (*see K.B.* 1905, p. 62), Sir William's influence and conspicuous ability marked every sphere of the activities of Kew. No detail in administration was too small to escape his notice, while in the wider realms his broad outlook embraced every aspect of botanical work relating to our Colonies and overseas Possessions. The possibilities of Kew as a great centre for imperial work had been foreseen by Sir Joseph Banks, when he was virtually Director of the Gardens in the days of George III, and it was Thiselton-Dyer who again fully visualised the need and importance of such a centre at the heart of the Empire, and spared no pains to achieve this ideal. Hooker early recognised the remarkable power of vision possessed by his Assistant Director, for he had been definitely selected by him to undertake the growing Colonial work of Kew, which led to so many important and far-reaching results. It may be mentioned here that though Thiselton-Dyer was no traveller and never had the opportunity of visiting any of our overseas domains, yet such was his grasp of a situation and so extensive was his reading, that he knew more of their botany, their economic needs and their possibilities for

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\*We regret that in *Kew Bulletin* No. 1, 1929, p. 32, Sir William's death was stated to have occurred on Christmas Eve. He died early in the morning of Dec. 23rd.

development than did many of those whose life lay in the countries themselves.

The great work he was able to accomplish for the development of Botanical Enterprise in the widest sense throughout the Empire, fully justified his appointment as Botanical Adviser to the Secretary of State for the Colonies, which post he held until March 31st, 1906, and which was recognised by his being created C.M.G. in 1882, and K.C.M.G. in 1899. The link with India was as close as with the Colonies, and it is of interest to recall that one of his earliest pieces of scientific work (in 1873), was the description of the Indian species of six natural families\* of flowering plants, published in Vol. II of the "Flora of British India." The value of the assistance given by Kew especially with regard to the preparation of the "Flora of British India" and to the many questions relating to the economic plants of the country was rewarded by the C.I.E., which was conferred on Thiselton-Dyer in 1892. It will be remembered that Sir William Hooker drew out proposals and submitted a definite scheme for Indian and Colonial Floras in 1865, and, of these, the "Flora of British India" was commenced in 1872. This was still in progress when Thiselton-Dyer became Director in 1885, and to its completion he devoted all the resources of the herbarium, with much supervision on his own part, until the final volume was published in 1897.

With the achievement of this great work in sight, he was able to resume the preparation of the two great African Floras, the "Flora Capensis," commenced in 1859 and suspended after 3 volumes had been published, in 1865, and the "Flora of Tropical Africa," the earlier volumes of which were published during the years 1868-1877. Work on the "Flora Capensis" was resumed in 1896, and it was edited by him with meticulous care, the final volume being published in the year 1925 (*see K.B.* 1925, p. 289).

The preparation of the "Flora of Tropical Africa" was taken in hand again in 1897, and this he edited until 1913, when he passed on the editorship to his successor, Sir David Prain. Those who are able to realise what the editing of these Floras entailed in the way of intimate knowledge and scrupulous accuracy—for Thiselton-Dyer was so competent a descriptive botanist that he was a perfect Editor—will understand that the appellation denoted sustained and detailed labour on his part. He had therefore very little leisure for carrying out much in the way of original research, though the articles he published in botanical journals were always sound and real contributions to the advancement of natural knowledge. In spite of these calls on his time and energies, in addition to his administrative duties as the head of a large Institution—about which something will be said later—he conceived the idea of starting a periodical publication from Kew for the purpose of supplying information to the Colonies, with their Botanic Stations, and to

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\*Portulacaceae, Tamariscinae, Elatineae, Hypericineae, Ternstroemiaceae, Dipterocarpeae.

overseas possessions generally, on matters of botanical interest and importance in connection with the wider aspects of botanical science, and more especially in connection with their economic resources.

For this purpose, the "Kew Bulletin of Miscellaneous Information" was started in 1887, and in the same connection reference may be made to the publication of the Guide books to the Kew Museums, which he took in hand after he had thoroughly overhauled and re-arranged the collection of specimens illustrating the Economic products derived from the vegetable kingdom. The carrying on and editing of the "Index Kewensis," of Hooker's "Icones Plantarum" from 1895 to 1906 and of the "Botanical Magazine" during 1905 and 1906 were additional tasks to which he gave his most careful attention.

Though the work of Kew was the first call on his time and activities, he was always ready to lend his powerful support to any cause likely to further the progress of Botany and botanical teaching, and the action he took with regard to the Chelsea Physic Garden was of the greatest value, not only because it enabled an historic garden to be preserved, but also because a botanic garden for the promotion of botanical teaching in London was definitely established on sound and safe lines. Thiselton-Dyer took infinite pains, ably supported by Sir Henry Longley, to secure the retention of the Physic Garden as a garden for students, and it was mainly due to his efforts that the scheme finally drawn up by the Charity Commissioners in 1898, after several years of negotiations, was adopted and carried into effect in 1899.

With regard to the University Botanic Garden and the Botany School at Cambridge, he was also called in for advice by Sir Michael Foster and others, with valuable results. The following tribute\* from Dr. Walter Gardiner, F.R.S., is of interest in showing the help he gave to the building up of the Botanical Museum at Cambridge, which was one of the many causes connected with the teaching of Botany he was always ready to assist.

"To Sir William Thiselton-Dyer we allude many times in the Reports under the designation Kew. When I state that whatever—in reason—we asked for from Kew we always obtained, and that, besides mere specimens, a vivid personal interest in our doings, and wise advice—sometimes stern, always encouraging—was never denied us, I shall sufficiently show how much we owe him, and anyone conversant with his powers of organisation and administration and his mental outlook and equipment, is in a position to gauge the good fortune that Cambridge Botany has experienced in having as its constant friend the Director of Kew. It is my deliberate opinion that to him—and in more directions than in that of Botany—the University of Cambridge owes a debt of gratitude which she can never repay."

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\*Extract from "The Foundation and Re-Establishment of the Cambridge Botanical Museum," 1904.

The Botany School at Oxford also owed much to the advice given by Thiselton-Dyer, when the matter of the reorganisation of the Department was being considered in 1884.

In the year 1888 he presided over the Biological Section (D) at the meeting of the British Association held at Bath, the title of his address being "Botanical Biology," and in 1895 he was very properly chosen to be first President of the new Botanical Section (K) at the Ipswich meeting of the Association held in that year, since he was very largely responsible for its creation as a separate Section. Unfortunately he was compelled, owing to the heavy calls of his official work, to decline nomination to the Presidency of the Association.

Thiselton-Dyer became a Fellow of the Linnean Society in 1872, and served on the Council from 1874 to 1876, and again from 1884 to 1887, and was a Vice-President from 1885 to 1887.

In the year 1880 he was elected a Fellow of the Royal Society. He served on the Council for the years 1886-1887 and was Vice-President in 1896-1897. In addition to the work entailed with these Societies he was a Vice-President of the Royal Horticultural Society from 1887 to 1889, and was largely concerned with its resuscitation and reorganisation when it was almost moribund about 1887. It was largely due to his help in initiating a new policy that the present wonderful prosperity of the Society has resulted.

He was also a Fellow of the University of London from 1887 to 1890.

Other calls on his time were his service as a Royal Commissioner for the Melbourne Centennial Exhibition in 1888, the Paris International Exhibition in 1900, and the St. Louis Exhibition in 1904. During the summer of 1900 Thiselton-Dyer served on the Departmental Committee appointed by the Board of Agriculture to enquire into the conditions under which agricultural seeds are sold. To the report, which he signed, he added some reservations which exhibit his usual broad grasp of a complicated and difficult situation (*see* Cd. 489 and 493, Committee on Agricultural Seed, 1901).

It was in this year also that he was appointed Technical Adviser to the Board of Agriculture.

Yet another example of the way in which Thiselton-Dyer exerted his influence, personal as well as official, unweariedly and with great effect for the expansion of Botanical Science in this country, is afforded by his action when the question of founding the "Annals of Botany" was being considered by a small committee of botanists in 1887. The proposal was on the point of being dropped, but Thiselton-Dyer, with his power of vision, succeeded in inducing the committee to proceed with the project in spite of the many apparent difficulties, and his action at that time has been more than justified.

Turning now to Kew itself, it should be recalled that up to the year 1903, the Gardens had been administered by H.M. Office of Works, but in this year, at the instance of the Board of

Agriculture, the administration was transferred to the latter Department by Order in Council. A condition of the Treasury assent to the transfer was the preservation to the Foreign Office, Colonial Office and India Office, of the right of direct correspondence with Kew.

The main lines of Thiselton-Dyer's work are well summarised in the following Address which was presented to him on his retirement :—\*

"On the occasion of your retirement from the position of Director, we, the undersigned, members of the Staff of the Royal Botanic Gardens, Kew, desire to express our regret at the severance of the ties which have so long united us and to convey to you our wish that you may be granted health to enjoy for many years the leisure so well earned by your long and strenuous career.

"During the thirty years of your connection with Kew the establishment has undergone many great improvements and extensions mainly due to your persistent efforts. Not the least of these improvements is the beautifying of the Gardens by opening vistas in the woods and by extensive planting throughout the grounds of masses of ornamental shrubs and herbaceous plants.

"Almost every glass-house has been rebuilt on more attractive lines and the completion of the Temperate House was an achievement that marks an epoch. It may be added that the collections of living plants were never richer and never in better condition.

"The Jodrell Laboratory was arranged and equipped, and for a long time worked, under your personal supervision.

"The Herbarium buildings have been greatly extended, and the collections and library are now second to none in the world.

"The Museum buildings have also been enlarged and modified and the collections rearranged under your direction.

"We members of the permanent staff have much cause to be grateful to you for obtaining a favourable revision of our salaries.

"But it is not your work at Kew alone to which we can refer with satisfaction and admiration. The British Colonies and Possessions in all parts of the world are more or less indebted to you for direct aid and for the foundation or support of their Botanical Establishments.

"We also realise the fact that your close devotion to administrative and executive work has limited your opportunities for original research—a great sacrifice to one whom we are proud to name as the pioneer in this country of modern botanical teaching. Your laboratory classes at South Kensington in the seventies were the first of their kind in England, we believe, and have not been surpassed. Since those days you have exercised a powerful influence in the promotion of Biological Research. The successful career of the Annals of Botany is largely due to your energy, when others hesitated ; and the founding of Section K of the British Association was entirely your own work."

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\*See *K.B.* 1905, p. 62, where the names of the signatories are given.

The beautifying of the Gardens by the removal of trees in order to open up vistas and produce broad and pleasing effects was always a matter to which Thiselton-Dyer devoted much time and care. He supervised every alteration and attended to the smallest detail, whether it might be the mode of pruning of a particular tree or the planning of some larger alteration, the ultimate effect of which he had exactly visualised long before the work had been put in hand. He was a real artist in landscape gardening, and the spacious effects of Kew to-day are, in the main, due to his vision and artistic skill, which enabled him to produce noble landscape effects, which have all the charm of appearing perfectly natural.

It was also thanks to his appreciation of the effectiveness of bold masses of colour that the groups of Forsythias, Berberis and other flowering shrubs and herbaceous plants were placed in the Arboretum. The Azalea garden also was greatly developed and improved during his Directorate. A considerable area near Kew Palace, including the Palace Lawn, was added to the Gardens, and, by the removal of the old Palace Stables and other buildings, he greatly improved the amenities at this end of the Gardens. The Bamboo Garden was made, and also the Rose dell near the Pagoda and the Lily Pond. The Rock Garden was designed by Thiselton-Dyer on the plan of a Pyrenean dry valley, and its construction was carried out under his supervision, while in 1887 he added greatly to the growing interest in Rock Garden plants by the provision of the Alpine House, then quite a novel department in the culture and display of Alpine plants. It is unnecessary here to give particulars from the Archives of all that he was able to achieve in the way of Greenhouse rebuilding and additions, but the completion in 1899 of the Temperate House or Winter Garden, which had been left unfinished since 1862\*, and the rebuilding of the Succulent House were among the more important events. In the Private or Nursery grounds, nearly all the glasshouses were remodelled or entirely rebuilt, and all the toolsheds and stores were replanned and careful regulations were drawn up to ensure methodical arrangement and a proper care of the tools.

The building of the Jodrell Laboratory, through the munificence of Mr. Phillips Jodrell on Thiselton-Dyer's suggestion, was a natural development for Kew when its Director was imbued with so intense a feeling for the living plant. It was in fact the obvious need of a Botanic Garden, where every opportunity is afforded to the botanical student to prosecute researches among the plants from every clime which are gathered together in the open or under glass. More particularly must this need have been felt by Dyer after his earlier efforts in botanical teaching when, like Huxley for Zoology, he revolutionised the old academic methods.

For many years he supervised the Laboratory himself and paid frequent visits to those carrying out their researches in the building.

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\*See *K.B.* 1914, pp. 298 and 393.

"Here," as Professor F. O. Bower, F.R.S., a former worker there, writes, "a long succession of workers young and old have carried out research and the writer gladly acknowledges the frequent stimulus and suggestion let fall perhaps in a single sentence, seemingly by accident rather than set design, that came to him from Dyer in his frequent visits to the Laboratory."

The Herbarium had been extended in 1877 under Sir Joseph Hooker, but so great were the accessions, due to the place Kew was taking as the centre for the Botanical work of the Empire, and the interest in floristic work which Thiselton-Dyer had brought about, that the new wing had to be built in 1902. This more than doubled the size of the Herbarium and very largely extended the accommodation for the Library.

Another matter, somewhat trivial though it may now seem, the value of which, however, has borne the test of time, was the conversion of the uniformed attendants at Kew into an efficient corps of Constables under a Sergeant. Since the safety of the collections and the comfort of the visitors so largely depends on the efficiency and courtesy of this body of men, the discipline he introduced has greatly added to their usefulness. As in all matters of this kind, he closely associated himself with his staff and was made "Inspector of Constables," which title is still borne by the Director, and he wore the Constable's uniform when making his official round of the Gardens.

Something has been said about Thiselton-Dyer as a Botanist, but reference must be made to his interest in and deep knowledge of the Classics, which can be traced back to his early days at Oxford. It was after his retirement that he was able to pursue his keen interest in the identification of Classical plants, and, with his wide knowledge of ancient Botany and of Classical literature, his contributions to Liddell and Scott's *Lexicon*, to the "Companions to Latin and Greek Studies" and to the *Journal of Philology*, though representing but little of his great store of knowledge, mark him as a scholar worthy of his University.

Turning now to his earlier years, Thiselton-Dyer was born in Westminster on July 28th, 1843, and no doubt inherited some of his scientific tastes from his father, Dr. W. G. Thiselton Dyer. His education commenced at King's College School, where the late Dr. Henry Trimen was one of his contemporaries and with whom he used to go on botanical excursions around London. He then went to King's College, London, intending, like Trimen, to study Medicine—he became a 'member by apprenticeship' of the Society of Apothecaries—but, changing his plans at the age of twenty, he went up to Oxford and entered Christchurch as a Junior Student. He took his degree in Mathematics, an achievement of which he was justly proud, and followed this distinction by being placed in the first class of the final school of Natural Science in 1867.

In 1868 he was appointed Professor of Natural History at the Royal Agricultural College, Cirencester, where Dr. A. H. Church



was Professor of Chemistry, and with him prepared an edition of Professor S. H. Johnson's book "How Crops Grow," adapted to English conditions. The friendship between Thiselton-Dyer and Church was life-long and resulted in many gifts to Kew and much valuable help from that eminent Chemist, who was also keenly interested in botanical matters.

The early friendship with Trimen was also a lasting one, and one of its first fruits was the "Flora of Middlesex" commenced by them in 1866 and published in 1869.

In 1870 Thiselton-Dyer, after taking his London B.Sc. degree, was appointed Professor of Botany in the Royal College of Science, Dublin, where from the Syllabus of his course of lectures it may be seen he was already striking out an entirely new line in botanical teaching.

Returning to London in 1872 he was appointed Professor of Botany to the Royal Horticultural Society, and it was then he came in touch with Kew and with Huxley, who was Professor of Biology in the Royal College of Science. It was in this year that Huxley organised his memorable course in Elementary Biology at South Kensington, with Thiselton-Dyer as one of his demonstrators. Dyer tells something of the story in his Presidential Address to Section K at Ipswich in 1895.

In 1873 Huxley, being abroad through ill-health, requested Thiselton-Dyer to arrange a course of Instruction for Science Teachers on similar lines for the vegetable kingdom. This Course was held under the auspices of the Science and Art Department, and he gave courses of the same character to Science Teachers in 1874, 1875, 1876 and again in 1880. For the course in 1875 (Professor) S. H. Vines was his Assistant, and for the 1876 course (Professor) Vines and the late (Professor) H. Marshall Ward, who had attended the course as a student in 1875, acted as demonstrators. It may be mentioned in passing, that it was due to this association of Vines, then an Undergraduate at Christ's College, Cambridge, and shortly after a member of the Botany School Staff, that the new and revolutionary Botanical teaching—as it then seemed—was duly inaugurated at Cambridge. Dyer's course was the starting point of a new movement in Botany, a renaissance of Hensley's effort of twenty years before of the study of plants as living organisms and not as dried Herbarium specimens.

A permanent outcome of these lectures and demonstrations is to be found in the "Course of Practical Instruction in Botany" by Bower and Vines; Part I, with a preface by Thiselton-Dyer, being published in 1885, and Part II in 1887.\* This was originally intended by Thiselton-Dyer to be a manual of the teaching he had given in his South Kensington course with outlines of his lectures and illustrations. Owing to his work at Kew as Assistant Director,

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\*A second complete edition, including both parts, was published by Prof. F. O. Bower in 1888.

however, he was not able to give much time to the book, though he supervised the preparation of the illustrations which were drawn by Vines at Kew. Unfortunately they were never reproduced in the book.

Another memorable event in Thiselton-Dyer's early botanical career was the influence exerted on him by the publication of Sachs' "Text Book of Botany," and his collaboration with A. W. Bennett in the translation of the first edition, which was published in 1874.

In 1875, as has been already recorded, Sir Joseph Hooker succeeded in getting the office of Assistant Director revived, and selected Thiselton-Dyer to fill the post to which he was appointed on June 12th, 1875.

On June 23rd, 1877, he married Harriet Ann, the eldest daughter of Sir Joseph Hooker, who fully shared her husband's botanical interests, and, being a skilled artist, enriched the Kew collection of drawings in addition to giving assistance with the drawings for the Botanical Magazine.

On the occasion of his 80th birthday on July 28th, 1923, Sir William received a congratulatory address from all the leading Botanists in Great Britain and Ireland (*see* "Nature," August 4th, 1923, p. 182), and on June 23rd, 1927, Sir William and Lady Thiselton-Dyer celebrated their Golden Wedding (*see* "Nature," July 30th, 1927, p. 162).

Sir William, after his retirement, interested himself in County matters in Gloucestershire, becoming a Justice of the Peace, and he also served on the County Education Committee as the representative of Oxford University, and was a member of the Court of the University of Bristol.

He was a constant correspondent with Kew almost to the end of his life, and his letters show the same unflinching interest in botanical affairs as had marked the days of his official career.

The funeral took place at Witcombe, Gloucester, on December 27th, 1928, and was attended by the Director.

In conclusion it seems fitting to publish here the minute he sent to the Secretary of the Board of Agriculture on his retirement in December, 1905, as it sets out very clearly the more important developments which were effected under his Directorship :—

Secretary,

It now only remains for me, before handing over my charge to my successor, to take leave of the Board in my capacity as Director, though I shall still have the honour of serving under it as Technical Adviser in Botany till the end of the financial year.

I suppose it does not always fall to the lot of an official to lay down the office entrusted to him with more entire satisfaction as to his past relations with his official superiors or more contentment with the state of efficiency of the establishment of which he relinquishes the control.

I think I am justified in saying that Kew never stood higher in public esteem or received higher recognition throughout the empire and I may add the civilised world.

The annual attendance of visitors bears witness to the one ; the constant recourse to the establishment for purposes of research by foreigners of all nationalities, to the other.

During the period of my Directorate much has been effected to improve the working and organisation of the establishment. I have been fortunate in securing the confidence of the Treasury and the necessary funds have been not illiberally placed at my disposal. I leave the establishment, with some small exceptions which no doubt will be shortly dealt with, in a thoroughly efficient state and well supplied with the appliances demanded by modern horticultural art.

I may summarise a few notable changes and improvements :—

Obstructive fences have been removed with the sanction of the Crown.

Grass drives facilitating the movements of large crowds have been driven through the woods, and sylvan scenery of great beauty has been made accessible.

The national arboretum first projected in 1846 has been steadily developed and is now without a rival at home and probably abroad.

A refreshment Pavilion has been provided which adds enormously to the comfort of our visitors.

The sanitary arrangements throughout the establishment have been progressively rebuilt.

Commodious mess-rooms have been provided for the labourers.

The great Temperate House, commenced in 1861, was finally completed in 1899.

The minor glass-houses have been mostly reconstructed on modern principles.

The working appliances have been greatly improved with manifest benefit to the health of the men, and a fine reading-room and commodious lecture-room have been provided for the young gardeners.

The advanced horticultural school has been greatly developed. Ten official appointments in the Colonies and India have been made from it during the past year. The experiment was tried with perfect success of throwing the school open to women and was only discontinued when the establishment of outside Horticultural Colleges supplied their needs.

Two Surrey County scholars from the elementary schools of the Borough are now admitted annually for training in horticulture.

The Museums have been thoroughly reorganised and enlarged. They are in constant request in the solution of commercial enquiries and are undoubtedly unique.

The Herbarium, by far the most extensive and best organised in the world, has been enlarged and made fire-proof.

As regards colonial work an active part has been taken in the economic development of West Africa by means of the establishment of Botanic Stations. The rubber export from the Gold Coast sprang from nothing in 1882 to a value of more than half a million pounds in 1898 owing to the identification of a rubber plant at Kew. That of Cocoa was £4 in 1892, rising in 1904 to over £200,000. This has been accomplished under Kew guidance by an officer trained at Kew.

Para rubber introduced into our Eastern Colonies in 1876 has now given rise to a planting industry the limit of which can hardly be foreseen.

Sir Daniel Morris, the late Assistant Director, has organised with great success a Department of Agriculture in the West Indies.

Of the *Kew Bulletin* (temporarily in abeyance) some 18 volumes have been issued covering information of every kind in relation to Tropical Agriculture. The contents have been widely diffused by reproduction in Colonial and Indian journals.

As regards home agriculture the Board's publications have been systematically revised, and at no distant date plain information on every malady of crops amenable to treatment will be available for farmers.

On the scientific side the output of work has been large. I have seen, under the editorship of my predecessor and with the aid of the staff, the completion of the *Flora of British India* (7 volumes). An *Enumeration of the Plants of China* (3 vols.) has been completed. Under my own personal editorship the voluminous *Floras of Tropical Africa and South Africa* have made continuous progress. Lastly the vast *Index Kewensis* enumerating the names and bibliography of all known plants has been elaborated at Kew, and is an indispensable authority in every botanical establishment in the world.

I will not extend this brief summary into greater detail. I will only add that in my successor the Board is fortunate in securing a Director of scientific distinction and tried administrative capacity into whose hands I resign my task with perfect confidence.

W. T. T.-D.,

December 15th, 1905.

#### XIV.—NOTES ON TRINIDAD PLANTS. N. Y. SANDWICH.

In the course of checking the manuscripts of the new *Flora of Trinidad and Tobago*, which is now being issued in parts\* by the Department of Agriculture of those islands with the collaboration of Kew, it is natural that questions of taxonomic interest to students of the flora of this and neighbouring regions of Tropical America should constantly arise, and it is thought that some of these may be worthy of record from time to time. The following notes refer to

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\*Vol. i, Part I, pp. 1-22 (Ranales), and Vol. ii, Part I, pp. 1-48 (Rubiales), both published in August, 1928.

the most important and difficult points that have been dealt with recently.

**I. *Rinorea* in Trinidad.** Two species of this genus are found in Trinidad, and as both have been recently confused and misinterpreted, it may be of interest to give some account of them. When Dr. S. F. Blake published his careful revision of Tropical American *Rinoreae* in 1924, he was greatly handicapped by not seeing two very important types, that of *Riana guianensis* Aubl. which is the basis of *Conohorea Riana* DC. and of *Rinorea Riana* Kuntze, and that of *Alsodeia Lindeniana* Tul. (*Rinorea Lindeniana* Kuntze). Thus for his identification of *R. Riana* he relied upon information and a sketch of Aublet's type which were supplied by the British Museum, while his conception of *R. Lindeniana* was derived from reading Tulasne's description, which unfortunately contains two serious inaccuracies in what perhaps appeared at the time to be small details of little importance. A careful examination of Aublet's type of *Riana guianensis* and of the type collection of *R. Lindeniana*, as well as of a large amount of Guiana material of *Rinorea* which Dr. Blake was unable to see in America, proves the following facts:—

(a). Blake's *R. Riana* (DC.) Kuntze of Colombia, Venezuela and Trinidad, a plant with small flowers in compound racemes and with the style strongly bent at the base, is *R. Lindeniana* (Tul.) Kuntze. This identification is incidentally confirmed by Melchior in his recent treatment in the *Pflanzenfamilien* (2 Aufl. 21, p. 352, 1925).

(b). There was no necessity for Blake to separate *Lindeniana* as something distinct from his *Riana*. The type collection of *Alsodeia Lindeniana* (Linden 247), while agreeing in all other respects with Tulasne's description, has the axis of the inflorescence definitely pubescent under a lens (*not* glabrous, the character used by Blake in his key), and the free part of the staminal gland is longer than would be assumed from Tulasne's words. *Linden* 247, in fact, agrees exactly in foliage, inflorescence and floral-dissections with Blake's description of *Riana* and with a Trinidad plant (*Dannouse* 6421) which he cites under that and of which there is a sheet at Kew.

(c). Blake never saw any specimens of the true *Rinorea Riana* (DC.) Kuntze, which is a totally different plant occurring in Trinidad, where its range meets that of *R. Lindeniana*, in Eastern Venezuela, and above all in the three Guianas where it is plentiful. A very large series of specimens from Guiana in the Kew Herbarium agree perfectly with Aublet's type of *Riana guianensis* in all details, but none of these specimens are cited by Dr. Blake, and hence the true *R. Riana* finds no place whatever in his revision. This misinterpretation of *R. Riana* has been incorporated by R. Knuth in his *Initia Florae Venezuelensis*.

(d). The plant which is mentioned by Grisebach in the *Flora* of the British West Indies as occurring in Trinidad, under the name *Alsodeia flavescens* Spr., is *R. Riana*. Crueger's collection, cited by

Grisebach, is represented at Kew, and though the flowers are immature, it obviously agrees with the true *Riana*. *R. flavescens* (Aubl.) Kuntze is, of course, a quite different species with a glabrous ovary. The occurrence of these two species, *R. Riana* and *R. Lindeniana*, in Trinidad and even in the same locality (Arima) is of great interest.

*R. Riana* and *R. Lindeniana* differ remarkably in almost innumerable points. Besides the more obvious and important distinctions in the character of the inflorescence, the size of the flowers and the shape of the style, the following have been verified from an examination of numerous specimens and dissections: the leaves of the two species are at once distinguishable both by the length of the acumen and by their shape at the base; the inflorescence dries a different colour in each; the buds have a different shape; the sepals have a different shape and different measurements; the dimensions of the petals are different; the stamens differ in nearly every detail possible, except in the length of the filament; and the styles differ in length as well as in shape. The following is a summary of the important distinguishing characters of both species, with their synonymy and distribution:—

**Rinorea Lindeniana** (Tul.) Kuntze, Rev. Gen. i. 42 (1891). *R. Riana* Blake in Contr. U.S. Nat. Herb. xx. 503, t. 32 (1924), non (DC.) Kuntze. *Alsodeia Lindeniana* Tul. in Ann. Sci. Nat. sér. iii. 7. 364 (1847). *A. guianensis* var. *Lindeniana* Eichl. in Mart. Fl. Bras. xiii. pars i, 387 (1871).

*Leaves* elliptic-oblong to oval-oblong, the acumen shorter than in *R. Riana* and rarely up to 1.5 cm. long, oblique at the base and at least one of the margins rounded or even cordate into the petiole (cf. Blake's figure), less strongly reticulate on both sides than those of *R. Riana*; petiole 3–5 mm. long. *Inflorescence* compound-racemose, the flowers drying a rather light brown, the buds small, ovate and obtuse. *Sepals* obtuse, not conspicuously ribbed on the back, 1–1.5 mm. long. *Petals* glabrous or rarely very minutely ciliolate in the lower half, up to 3 or rarely 3.5 mm. long, often shorter. *Stamens* up to 2.2 mm. long; filament about 0.5 mm. long, the free part of the gland as thick as the filament, 0.5–0.7 mm. long; anther ovate, as broad as the connective-scale, 1–1.2 mm. long; connective-scale 1.5–1.8 mm. long. *Style* strongly bent at the base, up to 1.5 mm. long.

TRINIDAD: Maracas, 1900, *Dannouse* 6421; Arima, 1904, *McLean*. Blake (l.c. 504) adds another locality.

VENEZUELA: Truxillo, Merida, *Linden* 247 of 1842 (type coll.). Blake gives several other localities.

COLOMBIA: various localities given by Blake (l.c.).

**Rinorea Riana** (DC.) Kuntze, l.c. non Blake, l.c. *Riana guianensis* Aubl. Pl. Guian. i. 237, t. 94 (1775), not *Rinorea guianensis* Aubl. (1775). *Conohorea Riana* DC. Prodr. i. 312 (1824). *Alsodeia*

*prunifolia* Spreng. Syst. i. 807 (1825). *A. guianensis* Eichl. in Mart. Fl. Bras. xiii. pars i, 387 (1871), partim. *A. flavescens* Griseb. Fl. Brit. W. Indies, 26 (1864), not *Conohorea flavescens* Aubl.

*Leaves* ovate-elliptic to elliptic-oblong, long-acuminate with the acumen at least 2 cm. long, acutely cuneate at the base and attenuate to the petiole, not oblique, reticulate on both sides but especially beneath; petiole 5–7 mm. long. *Inflorescence* simply racemose, the flowers conspicuously pedicellate and drying a dark brownish-chocolate, the buds normally ovate-lanceolate and sharply acute. *Sepals* acute or cuspidate, strongly and conspicuously ribbed on the back, 1.5–2 mm. long. *Petals* regularly ciliolate, especially in the lower half when mature, normally 4–5 mm. long. *Stamens* about 3 mm. long; filament about 0.5 mm. long, the free part of the gland thinner and shorter than the filament, rarely up to 0.4 mm. long; anther oblong-linear, 1.6–2 mm. long, narrower than the connective-scale; connective-scale usually 2.5 mm. long. *Style* straight, 2.2–2.5 mm. long.

TRINIDAD: Arima, February 1846, *Crueger*.

VENEZUELA: Eleanor Creek, Lower Orinoco, *Rusby and Squires* 129 (not cited by Blake).

BRITISH GUIANA: Essequibo, *Hancock*; wet lowland forest, Tumatumari, *Gleason* 9; dense upland forest, Tumatumari, *Gleason* 391.

SURINAM: *Hostmann* 243, 1126; *Splitgerber*, sine numero.

FRENCH GUIANA: *Aublet* (type in Herb. Mus. Brit.); *Poiteau*; *Karouany*, *Sagot* 33; *Melinon* 41 (1854); *Martin*.

It may be added that the remaining Guiana material of this genus, besides containing some undescribed species, presents problems of taxonomy and nomenclature which will prove of considerable difficulty to future students of that flora.

2. ***Xylosma Seemannii*** *Triana et Planch.* in Ann. Sci. Nat. sér. iv. 17. 99 (1862). As has been suspected by Britton and by Urban (Engl. Bot. Jahrb. xv. 299), the Trinidad plant which was referred by Grisebach to *X. nitidum* A. Gr. ex Griseb. and has for long been passing under that name, is distinct from the true *nitidum* of Jamaica. A series of sheets of both has been examined, and the Jamaican plant has been found to differ in the finer leaf-serration, the much weaker reticulation of the upper surface, and the different direction and anastomosing of the lateral veins, but above all in the sepals, which are conspicuously and regularly ciliate, and pubescent within over the whole surface; whereas the sepals of the Trinidad plant are veined and glabrous on both sides and on the margins except for a tuft of hairs and some weak ciliation near the apex. On the other hand, the Trinidad plant does agree remarkably well in these very points with the type collections of *X. Seemannii* Tr. & Pl. from Panama. Triana and Planchon themselves did not think Purdie's plant from Trinidad was quite the same as their species (they gave no reasons), but no serious discrepancy could be

discovered between them on a recent examination, and they both share the numerous characters which distinguish them from *X. nitidum* of Jamaica. The type collections of *Seemanni* were unarmed, and so are two Trinidad sheets in the Kew Herbarium, though others bear conspicuous spines. It is clear that a revision of this genus may show that *Seemanni* itself can be identified with some earlier described species from Central or Northern South America, but pending such a critical and lengthy investigation no better name can be given to the plant which grows in Trinidad.

3. ***Elsota tenuifolia* (Chodat) Sandwith** comb. nov. *Securidaca tenuifolia* Chodat in Bull. Herb. Boiss. 3. 545 (1895). *Elsota coriacea* (Bonpl.) Blake in N. Am. Fl. 25, 374 (1924). *E. chrysotricha* Riley in Kew. Bull. 1927, 119. The late Mr. L. A. M. Riley gave reasons for rejecting Blake's combination *E. coriacea* (Bonpland) for the plant of Trinidad and Panama, and described it under the new name *E. chrysotricha*. This, however, proves to have been unnecessary, for Chodat had already described the Trinidad plant as *Securidaca tenuifolia* so long ago as 1895. The types of *S. tenuifolia* and its form *velutina* have been borrowed from Berlin, and they cannot be distinguished specifically from the collections cited by Riley.

4. ***Simaba multiflora* Juss. and *S. guianensis* Aubl.** Here we have an instance of the unfortunate combination of two totally distinct and easily recognised species under one name owing to an author's omission to examine a type specimen and the consequent errors in identification. In the Flora Brasiliensis, Engler applied Aublet's *guianensis* (*Aruba guianensis* and *Simaba guianensis*) to a plant which is widely spread in Guiana and Brazil, and occurs also in Trinidad and St. Vincent. He treated as synonymous with it Jussieu's *multiflora* (with a note of interrogation to indicate uncertainty), and proceeded to divide it into two varieties based on the shape of the leaflets: var. *Schomburgkiana*, with which *S. foetida* Benth. is rightly treated as synonymous, and which he identifies with Aublet's *Aruba guianensis*; and the much rarer var. *angustifolia* (*S. angustifolia* Benth.), under which he places Aublet's *Simaba guianensis*. He has a curious inaccuracy in the citations of *S. foetida* and *S. angustifolia*, which Bentham described from Spruce's material, attributing them to Dalzell, but Dalzell's Contributions to the Botany of Western India is a paper occurring earlier in the same volume of Hooker's Kew Journal of Botany.

There are large series of this plant in the National Herbaria. Its leaves bear 5-9 (very often 7) leaflets which dry a brown or brownish-olive colour and, in the common variety, are obovate in outline, being very shortly but conspicuously cuspidate at the apex, or in some forms rounded-obtuse, or even (*S. foetida* Benth.) slightly emarginate; in the rare var. *angustifolia* the leaflets are narrow and lanceolate. The inflorescence is long, lax and many-



flowered, frequently as long as or even longer than the subtending leaf. The dissection of the flower agrees with that of Jussieu's *multiflora* in the figure which, with the necessary explanatory note, is the basis for that name, and the very name *multiflora* at once suggests the most obvious superficial character for distinguishing this plant from *guianensis*. Jussieu apparently published no normal description, and it is this omission which has doubtless caused all the subsequent confusion. On the same plate there is also a figure of a dissection of the flower of *S. guianensis* Aubl., showing the numerous remarkable points of difference between the two species. It is, therefore, almost inconceivable how, in the first place, Engler could have attempted to unite the two, even in the absence of a description of the leaves of *multiflora*, seeing that their floral parts are so carefully and deliberately differentiated by Jussieu; and secondly, how he could possibly identify this plant with Aublet's figures of *Simaba guianensis* and *Aruba guianensis*. Aublet's figures are often admittedly imperfect, but they could hardly be as wide of the mark as is necessitated by this identification. On examination, the Aublet types at the British Museum prove to be very like his figures, in fact to represent a species which bears no resemblance whatever to Engler's plant, which is without doubt *S. multiflora* Juss. The leaves of Aublet's *guianensis* (both *Aruba* and *Simaba*) bear only 3-5 larger, relatively narrower and more elliptic, olive-green leaflets, which are attenuate at the apex into a conspicuous emarginate acumen. The inflorescence is extremely short and congested, often barely longer than the subtending petiole; while a glance at Jussieu's figures will suffice to show how different is the floral structure from that of *multiflora*. This species is far more local than the other and is apparently confined to French Guiana (Aublet! L. C. Richard in Herb. Forsyth!). Jussieu's figure of the flower was based on L. C. Richard's own designs and manuscript, and the foliage of Richard's specimens agrees with Aublet's types which, unfortunately, bear no detachable flowers, but his pictures show that his inflorescences were exactly similar. It may be added that, although Aublet's specimens are so poor, there can be little doubt that Engler was right in believing that *Simaba guianensis* and *Aruba guianensis* represent one and the same species.

A third species, *S. cuspidata*, is closely related to *guianensis*. It was described by Engler from material collected by Spruce at the mouth of the Rio Negro, Brazil, and specimens collected by Splitgerber in Dutch Guiana are cited under it. There is a sheet of the Splitgerber gathering at Kew, and it agrees very well with the Spruce type except in the length of the style, which is much shorter. *S. cuspidata* appears to differ from *S. guianensis* both in foliage and floral characters; but it is possible that further collections of *guianensis* will prove to be intermediate.

Meanwhile the West Indian *multiflora* was confused by Grisebach with the Venezuelan *S. orinocensis* H.B.K., a species

which clearly differs both in its glabrous gynophore and its fruit. Engler placed the St. Vincent plant under the var. *angustifolia* of his *guianensis*, but it agrees very much better with the commoner var. *Schomburgkiana*. The species of *Simaba* which grows in St. Vincent and Trinidad is, in fact, *S. multiflora* Juss., and there is no necessity for retaining the name *Schomburgkiana* unless the trinomial method be adopted. Even in the absence of evidence as to the shape of the leaflets, it is fairly certain that Jussieu's plant must have been the ordinary form of the West Indies, Guiana and Amazonian Brazil. *Angustifolia*, which probably deserves to rank as a good variety, appears to have been collected only once.

The references of these two confused species are as follows :—

(1). ***Simaba multiflora*** Juss. in Mem. Mus. Par. xii. 539, pl. 27, f. 45a (1825). *S. guianensis* (Aubl.) Engl. in Mart. Fl. Bras. xii. pars ii. 211 (1872-7), non *Simaba guianensis* Aubl, nec *Aruba guianensis* Aubl.

var.  $\alpha$ . *Schomburgkiana* (Engl. l.c. 212, sub *S. guianensis*). *S. foetida* Benth. in Hook. Kew. Journ. iii. 350 (1851). *S. orinocensis* Griseb. Fl. Brit. W. Indies, 139 (1859), non H.B.K. *Aruba guianensis* Engl. non Aubl.

var.  $\beta$ . *angustifolia* (Spruce ex Engl. l.c., sub *S. guianensis*). *S. angustifolia* Benth. l.c. *S. guianensis* Engl. non Aubl.

(2). ***Simaba guianensis*** Aubl. Pl. Guian. i. 400, t. 153 (1775); Juss. l.c. 539, pl. 27, t. 45b. *Aruba guianensis* Aubl. Pl. Guian. i. 293, t. 115 (1775). The generic name *Aruba*, though occurring earlier in the same volume of Aublet, was rejected by authors in favour of *Simaba*.

## XV.—THE BOTANICAL NAME OF THE SUGAR MAPLE.

T. A. SPRAGUE.

The name *Acer saccharum* Marsh. was adopted for the Sugar Maple by Trelease in Rep. Miss. Bot. Gard. v. 93 (1894), and has been used in Engl. Pflanzenr. Acerac. 74 (1902), Gray's New Man. Bot. ed. 7, 558 (1908), C. K. Schneider, Ill. Handb. Laubholz. ii. 243 (1909), Britton and Brown, Ill. Fl. ed. 2, ii, 496 (1913), Bean, Trees and Shrubs hardy in the British Isles, ed. 3, i, 158 (1921), Sarg. Man. Trees N. Am. ed. 2, 688 (1922), Rehder, Man. Cult. Trees and Shrubs, 565 (1927), and Sudworth, Check List For. Trees U.S. 187 (1927): in other words it has been generally accepted by critical botanists of different schools as the correct name for the Sugar Maple for the last thirty years and more. Consequently it should not be lightly abandoned.

Mr. K. K. Mackenzie has recently stated (Rhodora, xxviii. 111: June 1926) that "Marshall never published any such species. The name '*Acer saccharum*' does, it is true, appear as cited, but this was merely a typographical error for *Acer saccharinum* L. In the revised French edition of Marshall's work (Catalogue alphabétique des

Arbres et Arbrisseaux), which appeared in 1788, the error was corrected (p. 4), and the full citation '*Acer saccharinum* Linn.' was given in place of '*Acer saccharum*.' The use of the fictitious name '*Acer saccharum* Marsh.' should of course be abandoned."

The name *Acer saccharum* was published by Marshall in his 'Arbustrum americanum' p. 4 (1785). There is no evidence that it was a typographical error, nor is there any evidence that Marshall had anything to do with the French translation published in Paris in 1788 by Lézermes. Indeed, judging by the translator's preface, the footnote on p. iv, Lézermes's remarks on oaks (p. 198), and other passages, it seems fairly obvious that Marshall was not responsible in any way for the text of the French edition. The fact that Lézermes replaced the name "*Acer saccharum*," employed by Marshall, by "*Acer saccharinum* Linn.", is not evidence that Marshall intended to use the latter name.

The Rules of Nomenclature take cognizance only of established facts, and it is a fact that Marshall, in 1785, published the name *Acer saccharum* for the Sugar Maple.

It is possible that Marshall's "*Acer saccharum*" may have been a typographical error for "*Acer saccharinum*" or alternatively an amended spelling of that name, but this has not been proved, and in the absence of definite proof, Marshall's *Acer saccharum* stands as the correct name for the Sugar Maple.

## XVI.—ENGELMANNIA AND ANGELANDRA.

T. A. SPRAGUE.

Three different genera were named in honour of Dr. George Engelmann of St. Louis, Missouri, namely: *Engelmannia* Klotzsch in Wieg. Archiv. vii. 253 (1841), Euphorbiaceae; *Engelmannia* Torr. et Gray, Fl. N. Am. ii. 283 (1842), Compositae; and *Engelmannia* Pfeiffer in Bot. Zeit. iii. 673 (1845), Convolvulaceae. To add to the confusion, two of them were re-named *Angelandra* by Endlicher. *Engelmannia* Klotzsch is now included under the genus *Croton*, as a section, *Angelandra* Muell. Arg., while *Engelmannia* Pfeiffer has been re-united with the genus *Cuscuta*, from which it was originally segregated. *Engelmannia* Torr. et Gray, on the other hand, has been generally adopted, as for example in A. Gray, Synoptical Flora (1884), Small, Fl. Southeastern United States, ed. 2 (1913), and Britton and Brown's Illustrated Flora, ed. 2 (1913), as well as in Bentham et Hooker, Genera Plantarum (1873), Engler et Prantl, Nat. Pflanzenfam. (1890), Post et Kuntze, Lexicon Generum Phanerogamarum (1903), and Dalla Torre et Harms, Genera Siphonogamarum (1905). It is nevertheless an invalid name, both under the International Rules of Nomenclature and under the American Code.

The various authors who have adopted *Engelmannia* Torr. et Gray have done so under the mistaken impression that it was published in 1841, and that there was no evidence that it was antedated by *Engelmannia* Klotzsch. According to the late Dr. B. Daydon Jackson, however, volume ii. part 2, of Torrey and Gray's *Flora*, comprising pp. 185-392, appeared in April, 1842 (*vide* Journ. Bot. 1893, 298). *Engelmannia* Torr. et Gray is therefore antedated by the valid name *Engelmannia* Klotzsch (1841), and is consequently invalid under Art. 51, 2, of the International Rules. It follows that it should be called *Angelandra* Endl. The synonymy of two of the three groups concerned is given below: the third, *Engelmannia*, Pfeiffer, is universally treated as a synonym of *Cuscuta*.

**Angelandra** Endl. Gen. Suppl. iii. 69 (1843); Walp. Rep. ii. 605, 976 (1843), et op. cit. vi. 149 (1846-47). *Engelmannia* Torr. et Gray, Fl. N. Am. ii. 283 (1842), non Klotzsch (1841).—A monotypic genus of Compositae-Heliantheae, occurring in the Southern United States and Mexico. If it is desired to retain the comparatively well-known name *Engelmannia* Torr. et Gray, it will be necessary to conserve it. In view of the fact that the genus is monotypic this seems hardly worth while, especially since *Engelmannia* Klotzsch might at any time be revived as an independent genus.

**Croton**, sect. **Angelandra** Muell. Arg. in Linnaea, xxxiv. 79 (1865-66). *Engelmannia* Klotzsch in Wieg. Archiv, vii. 253 (1841). *Angelandra* Endl. Gen. Suppl. iv. pars 3, 91 (1850), non Endl. (1843).—A ditypic section of *Croton* (Euphorbiaceae), confined to North America. In the event of its being raised again to generic rank, it would bear the name *Engelmannia* Klotzsch.

## XVII.—NOTES ON AFRICAN GRASSES, IX.\*

SOME SALINE-LOVING GRASSES OCCURRING IN SOUTH AFRICA.  
C. A. SMITH & C. E. HUBBARD.

Whilst making a botanical survey of the Fauresmith Division in the Orange Free State, one of us collected specimens of two species of *Puccinellia* (*Atropis*) growing in strongly saline areas. One of these proved on examination to be *Puccinellia angusta* (Nees) Smith et Hubbard, represented at Kew by only one specimen collected by Ecklon, about one hundred years ago, in saline places by the Zwartkops River in the Uitenhage Division of the Cape Province, while the other is a new species, which is described below as *Puccinellia acroxantha*.

The specimens of *Puccinellia angusta* were collected during August 1927, in a very saline area (a little less than one acre in size) in a garden of the farm "Bakbank"; the locality having an altitude of about 4500 ft., and a mean annual (summer) rainfall of about 15 in. The site was covered some 4 or 5 years ago by a heavy crop of *Medicago sativa* L. (Lucerne), but due to wrong irrigation practices, such as

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\*Continued from *K.B.* 1929, p. 31.

continual irrigation from sources already containing Sodium and other metallic salts (sulphates, chlorides, etc.) in solution, the soil has become saturated with these salts. On account of the shallow-lying "hardbank" (the so-called hard-pan) and continual evaporation under the influence of the sun's heat, capillary action draws large quantities of the salts in solution to the surface where they are deposited, giving the white powdery surface known to the farming community as "brak." During the spring rains (from September onwards) the area becomes flooded for a comparatively short period and the saline deposit disappears, only to reappear more intensely again from about June to August—the winter months. Isolated Lucerne plants continued to flourish for a season or two, but eventually they completely disappeared, leaving the bare area which seemed useless from the point of view of profitable cultivation. It was interesting to note the migration to the higher and therefore less brackish part of the area, of *Picris echioides* L., an alien, and *Lactuca dregeana* DC., an indigenous "weed" which becomes a nuisance, particularly in gardens. Neither of these plants, however, has succeeded in penetrating to the lower lying more brackish areas.

During a visit to the "Bakbank" farm in the company of Mr. W. A. Rabie, who is in charge of the Fauresmith Botanical Reserve, it was arranged with the owner to sow seeds of various "brak bossies" (salinaceous plants) broadcast over the whole area and to watch carefully the outcome of the experiment—the first so far tried in the Union of South Africa with such a heavily saline soil. Accordingly seeds of the following plants were sown, while the brak was still there as a heavy deposit.—*Mesembryanthemum crystallinum* L., *M. geniculiflorum* L., *Galenia sarcophylla* Fenzl, *Atriplex capensis* Moq., *Salsola strobiliformis* C. A. Sm., *Hypertelis verrucosa* Fenzl. The results were highly satisfactory and numerous plants of all kinds appeared early in the following spring. The area was allowed to develop, undisturbed by weeding, grazing, trampling, etc., and the plants were subjected to an endurance test as far the saline nature of the soil was concerned. On the passing of the second growing season, several very important changes were noted. Firstly, the influx of several grasses—*Puccinellia angusta* and *Bromus unioloides* H. B. & K., and along the edge of the brackish area *Bromus japonicus* Thunb., with its var. *velutinus* Aschers & Graebn., appeared. The growth of the first-mentioned was remarkable, even in its early stages. It seemed to improve extraordinarily well towards the beginning of the winter season (June), and by August had attained a very dense, soft and luxuriant growth, being up to 2 ft. high and the tufts up to 6 in. in diameter at the base. Up to this time the grass had never been found growing in the saline areas of the Fauresmith Division. It is remarkable in many other respects, being one of the first plants to appear along enclosed water-furrows (in gardens, for example, where it grows in water) and within the enclosures around newly erected windmills. In addition it has the advantage over all



PLATE IV



*Puccinellia angusta* Smith et Hubbard, showing dense winter growth in the heavy saline deposits ( $\frac{3}{4}$  in. thick).  
In the background are plants of *Atriplex canescens* Moq

the other indigenous grasses, in being a "winter" grass and a perennial. Its palatability was next determined. Some sheep, in fair condition for that period of the year when the veld yields but poor grazing, were allowed to graze on the area; the result was that the grass was shorn to the ground, only the bases of the tufts being left. As far as is known at present, *Puccinellia angusta* shows every promise of being a valuable forage grass for saline soils. *Bromus unioloides* H. B. & K. is a well-known "winter" grass, and its appearance at that time created no surprise, but its strong vigorous growth under the heavy brackish conditions was an unexpected revelation. *Bromus japonicus* Thunb., being chiefly a summer grass, was then dying off and has no merit as a fodder grass.

Secondly, changes had taken place in the population of the "brack bushes." Of these the first to succumb to the test was the *Galenia* and then the *Hypertelis*. *Mesembryanthemum crystallinum* L., *Atriplex capensis* Moq., and *Salsola strobiliformis* C. A. Sm. were able to stand the test very well.

The experiment is still being continued by Mr. Rabie and its success is due entirely to that gentleman's unflagging zeal in collecting seed and in his subsequent supervision, together with that of the owner of the farm.

An emended description of *Puccinellia angusta* is given below, as additional material shows a considerable range in the size of the culms, leaves and panicles.

***Puccinellia angusta* (Nees) Smith et Hubbard**, comb. nov. A compact, densely-tufted perennial, with numerous intravaginal innovations. Culms erect or spreading and slightly drooping, 30–60 cm. long, slender, smooth, one-noded towards the base, terete above, compressed below, sheathed all along. Leaves mostly crowded near the base, short and erect or ascending and at length spreading and becoming recurved, glaucous and glabrous; sheaths smooth, the lower pallid or ultimately brown, membranous and shining, persistent, the uppermost firmer than the lower, exceeding the base of the panicle or with the panicle shortly exerted; ligules ovate or ovate-oblong, acute to obtuse, 2–3 mm. long, membranous, glabrous; blades very narrowly linear, acute, smooth except for the rough margins, 7.5–10 cm. long by 1.5 mm. wide when expanded, setaceously involute and subrigid or up to 30 cm. long by 2.5 mm. wide, flexuous, flat, weak and thin. Panicle erect or slightly nodding, linear, contracted, 10–30 cm. long, 1.5–2 cm. wide; rhachis slender, subflexuous above; branches very unequal, ascending, in distant fascicles of about 5, finely filiform to capillary, scaberulous, the shorter 1–3 spiculate, the longest up to 12 cm. long; lateral pedicels 1–4 mm. long, adpressed. Spikelets distant by about their own length or loosely imbricate, linear to linear-oblong, 4–5.5 mm. long, 1.5 mm. wide, loosely 3–6-flowered. Glumes ovate and obtuse when flattened, herbaceous with broad hyaline margins; lower 1.2–1.8 mm. long, 1–3-nerved; upper 2 mm. long, 3-nerved. Lemmas obliquely



oblong in profile, broadly elliptic-oblong and rotundately obtuse when flattened, 2-2.2 mm. long, membranous with hyaline purplish tips, 5-nerved, minutely pubescent below on the middle nerve and the outer side nerves. *Paleas* linear, minutely 2-toothed, keels shortly ciliate. *Anthems* 1 mm. long.—*Sclerochloa angusta* Nees, Fl. Afr. Austr. 381 (1841). *Atropis angusta* Stapf in Dyer, Fl. Cap. vii. 717 (1900).

CAPE PROVINCE : Uitenhage Division ; in saline places by the Zwartkops River, *Ecklon* !

ORANGE FREE STATE : Fauresmith Division ; " Bakbank " farm, in saline area in garden, 1380 m., August, *Smith* 4385 !

The specimen from which Dr. Stapf's description was drawn up bore the label Nieufeld (Nieuwveld), *Drège* 1827, and he believes that the label has been misplaced, and it is really *Ecklon*'s specimen from the Zwartkops River, the type of *Sclerochloa angusta* Nees. It is possible, however, that such a plant may have been collected in the Nieuwveld in the Beaufort West Division by *Drège*, as this contains similar saline areas to that in which *Smith* 4385 was collected. In addition it is much nearer to the Fauresmith Division than is the Zwartkops River. Meyer in " *Plantae Dregeanae* " however, does not include *Sclerochloa angusta* Nees as collected by *Drège*.

The other species, *Puccinellia acroxantha* Smith et Hubbard, is closely allied to *P. angusta*. It differs mainly in having 2-noded culms, firmer basal leaf-sheaths, and spikelets with larger paler lemmas. The specimens were collected on " Karroo-turf " soil of varying salinity, by the side of an eroded ditch periodically flushed with fresh rain water from the hillsides. Here it was growing in association with *Eragrostis* sp., *Lycium oxycladum* Miers, and *Monechma incana* C. B. Cl., the last two well-known on saline areas in the Fauresmith Division. The following is a description of this new species :—

***Puccinellia acroxantha* Smith et Hubbard**, sp. nov. ; affinis *P. angustae* Smith et Hubbard, sed culmis 2-nodis, vaginis foliorum inferiorum papyraceis, spiculis oblongis vel lanceolato-oblongis, lemmatibus longioribus differt.

A loosely tufted perennial with intravaginal and extravaginal (?) innovations. *Culms* erect or ascending from a short procumbent base rooting at the lowest node, up to 60 cm. high, slender, terete, simple, 2-noded, glabrous and smooth. *Leaves* glabrous, glaucescent ; lower sheaths moderately loose, firmly papyraceous, smooth, the upper firmer, finely striate ; ligules oblong, obtuse, up to 3.5 mm. long, membranous, glabrous ; blades very narrowly linear, loosely convolute, up to 18 cm. long, and about 2 mm. wide when unrolled, erect, slightly flexuous, smooth below, asperulous above. *Panicle* narrow, contracted, 12-20 cm. long, about 1.5 cm. wide, greenish ;

rhachis glabrous, more or less asperulous ; internodes up to 4.5 mm. long ; branches very unequal, densely clustered, some very short and one-spiculate, others up to 5 cm. long, suberect, simple or slightly branched, flexuous, very slender, asperulous, bearing numerous spikelets ; lateral pedicels adpressed, up to 2.5 mm. long. *Spikelets* lanceolate-oblong to oblong, about 5 mm. long and 1.5 mm. wide, 3-5-flowered. *Glumes* ovate, obtuse, herbaceous-membranous, with hyaline tips and margins ; lower 1-1.3 mm. long, 1-3-nerved ; upper up to 2 mm. long, 3-nerved. *Lemmas* when flattened broadly elliptic-oblong and rotundately obtuse, 2.5-2.8 mm. long, membranous with hyaline tip and margins, greenish with



*Puccinellia acroxantha* Smith et Hubbard. A. Spikelet ( $\times 8$ ). B. & C. Lower and upper glumes respectively ( $\times 16$ ). D. Lemma ( $\times 16$ ). E. & F. Palea ( $\times 16$ ). G. Ovary, styles and stigmas ( $\times 16$ ). H. Lodicules ( $\times 24$ ).

yellowish tips, five-nerved with the central and outermost nerves pubescent in the lower third, the remainder glabrous and smooth. *Paleas* linear, obtuse, keels shortly and coarsely ciliate.

ORANGE FREE STATE : Fauresmith Division ; Knoffelfontein, by side of eroded ditch below the Goedemansberg, c. 1390 m., Jan. 1928, *Smith* 5415 (in Nat. Herb. Pretoria & Herb. Kew).

The species of *Puccinellia* in other parts of South Africa are still very imperfectly known. Two species are recorded in the Flora Capensis, *P. angusta* Smith et Hubbard, referred to above, and *P. Borreri* Hitchc. The latter requires further study in South Africa and comparison with the plants of Western Europe. It is but poorly represented at Kew. Additional material to that enumerated in the Flora Capensis was collected by H. H. W. Pearson at Beukesfontein in sand near a spring (no. 4968), and at Karree Boom Fontein, in drying mud near a water conduit (no. 3924). Both are less than 4 in. high, with short convolute leaves and dense panicles. Somewhat similar examples are known from Weymouth and Poole in Dorset, collected by C. B. Clarke (nos. 3416 and 46800A).

## XVIII. BERGIUS, DESCRIPTIONES PLANTARUM, AND LINNÉ, MANTISSA PRIMA. T. A. SPRAGUE.

The two works which form the subject of the present communication were both published in the year 1767. That of Bergius was a descriptive account of a collection of dried plants brought back from the Cape of Good Hope by Michael Grubb, a Director of the Swedish East India Company, while Linné's 'Mantissa prima' included various new genera and species from the Cape, in addition to many from other parts of the world. It naturally happened that a certain amount of overlapping occurred, the same new species being described under different names in the two books: for example, *Gnidia viridis* Berg. Descr. 125 and *Gnidia simplex* Linn. Mant. 67 are now treated as conspecific (Wright in Dyer Fl. Cap. v. sect. 2, 53: 1915). The question which of the two works was published first is therefore of some practical importance, and the facts have accordingly been investigated in response to a request from Prof. C. E. Moss, who drew the writer's attention to this problem.

The chief difficulty encountered is concerned with the date and mode of issue of Linné's 'Mantissa prima.' It is independently paged, and has a separate (but abbreviated) title-page and separate index, but appears to have been issued in one part with the second volume of his 'Systema Naturae,' ed. 12. Not only is it commonly bound up at the end of that volume in botanical libraries, and also catalogued under it, but the last page of the second volume proper includes "Errata" from the 'Mantissa,' and has "Man—" (the first three letters of "Mantissa") at the bottom, in accordance with the then customary practice of printing the first few letters of each page at the bottom of the preceding one. It seems clear, therefore, that the second volume of the 'Systema,' ed. 12, and the 'Mantissa' were issued together, probably in a single part.

The dedicatory letter of Bergius, Descr. Pl. Cap., was dated Stockholm, 25 Aug. 1767, and as the book was published in Stockholm, it seems probable that it appeared in September, 1767. The date on the title-page of the 'Systema' ed. 12, vol. ii., and on that of the 'Mantissa' is 1767. Fortunately Linné's own correspondence\* shows which of the works has priority. He wrote as follows to N. L. Burmann: "Dr. Bergius edidit *Descriptiones plantarum ex Cap. B. Spei*. Stockh. 1767, 8vo. apud Salvium. Continet circiter 300 plantas descriptionibus exaratas, quas accepit a quodam Grubb, qui ad Cap. B. Spei in reditu ex Indiis fuit. Dum tomus secundus systematis mei imprimebatur et corrigebatur ab eius fratre, edidit suas descriptiones, quasi non vidisset meam Mantissam adeoque sua nomina imposuit singulis plantis et generibus. . . . Upsaliae 1768, d. 7 Maji" (Dr. Bergius has published *Descriptiones plantarum ex Cap. B. Spei*, Stockh. 1767, Salvius. It

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\*Smith, J. E., Sel. Corresp. Linnaeus, i. 221 (1821); Hall, H. C. van, Epistolae Ineditae Caroli Linnaei, 91, 103 (1830).

contains about 300 descriptions of plants which he received from a certain Grubb, who visited the Cape of Good Hope on his return from the East Indies. While the second volume of my 'Systema' was being printed and corrected by his brother, he published his own descriptions, just as if he had not seen my 'Mantissa,' and even gave his own names to individual species and genera). Later on Linné complained to Burmann that Bergius had never shown him even a single one of his Cape plants, and had published his 'Descriptiones' without changing the names of sundry new species, which were conspecific with those described in the 'Mantissa,' although he had seen proofs of the latter at the printers (Upsaliae 1768 d. 21 Novembr.).

In a letter to Ellis, dated December 8, 1767, Linné mentioned "Bergius's Descriptions of Cape Plants, published this year," and in the final paragraph informed Ellis that "the second volume of my 'Systema,' comprehending the Vegetable Kingdom, is just published." In view of the definite statements contained in Linné's letters to Burmann and Ellis, it is clear that Bergius's 'Descriptiones' was published before Linné's 'Mantissa.' In the absence of evidence to the contrary it may be assumed for working purposes that the 'Descriptiones' appeared in September 1767, and the 'Mantissa' in November, 1767.

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## XIX.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. J. D. SHEPHERD, O.B.E., Irrigation Officer, Agricultural Department, Palestine; Mr. M. VARDY, Manager, Experimental Fruit Farm, Sierra Leone; Mr. L. P. HENDERSON (Agricultural Instructor, Federated Malay States), Superintendent, Agricultural Department, Nigeria (*K.B.*, 1924, p. 27); Mr. H. M. GARDNER (Senior Assistant Conservator of Forests), Conservator of Forests, Kenya; Mr. G. N. SALE (Assistant Conservator of Forests, Cyprus), Director of Forests, Mauritius; Mr. A. W. ANDERSON, B.Sc., Superintendent, Agricultural Department, Nigeria; Mr. D. A. LANGDON, Produce Inspector, Nigeria; Mr. D. D'EMMERZ DE CHARMOY (Assistant Director), Director of Agriculture, Mauritius.

WILHELM BECKER. We much regret to record the death on October 12th, 1928, of Herr Wilhelm Becker of Kirchmöser (Havel), Germany, the well-known specialist on the genus *Viola*. Herr Becker has published several papers in the *Kew Bulletin*, and paid a visit to England last Spring, during which time he spent several days in the Herbarium.

RICHARD HIND CAMBAGE, C.B.E.—We record with regret the death of Mr. R. H. Cambage, C.B.E., the President of the Australian Association for the Advancement of Science, which took place at

Sydney, New South Wales, on November 28th, 1928. Mr. Cambage was formerly Chief Mining Surveyor of New South Wales, and from 1915-1924 was Under Secretary for Mines. He was a keen Botanist and devoted all his leisure time to botanical study. He contributed numerous papers to the Linnean Society of New South Wales, among them being "Notes on the Native Flora of New South Wales," which appeared in 10 parts, and "Notes on the Botany of the Interior of New South Wales," with plates, in 8 parts.

Acacia seedlings were also a subject of great interest to him, and he published 12 illustrated papers on this subject in the Proceedings of the Royal Society of New South Wales.

Mr. Cambage was President of the Royal Society of New South Wales in 1912, when his address, published in the Proceedings, was devoted to Antarctica and to the Development and Distribution of the Genus *Eucalyptus*; he was again President in 1923, when his address was on "Australian Resources of Liquid Fuels." He was elected President of the Australian Association at the meeting held at Hobart, Tasmania, in January, 1928.

DR. WILLIAM G. SMITH.—We much regret to record the death of Dr. William G. Smith, of the East of Scotland Agricultural College, which occurred at Edinburgh on December 8th, 1928. Dr. Smith was born at Dundee on March 20th, 1866, and graduated in pure Science at St. Andrews. Later he visited Germany and studied under Prof. von Tubeuf at Munich, where he gained the degree of Ph.D. He translated and amplified Tubeuf's work "*Pflanzenkrankheiten durch Kryptogamen Parasiten verursacht*," and "Tubeuf and Smith" was the standard work amongst mycologists and pathologists for many years. It stood alone in usefulness till the appearance of George Massee's writings, and even now is held in very high esteem. After his return to England Smith was appointed Lecturer in Botany at the Yorkshire College, Leeds (now Leeds University), and it was during this period of his career that he became celebrated as an ecologist, publishing many survey maps and ecological papers. He was attracted to this subject through his brother Robert Smith, who had in turn been inspired by the magnetic influence of Flahault. Smith was an enthusiastic member and also Secretary of that small band of workers known as the "British Vegetation Committee," from which sprang, in 1912, the "British Ecological Society," of which he was elected an Honorary Member.

In 1908 Smith was appointed head of the Biological Department of the East of Scotland Agricultural College, and it was from Edinburgh that he took up the study of Scottish grasslands with which his name will always be associated. During recent years he was more concerned with agricultural problems and was appointed Advisor in Agricultural Botany to the Scottish Board of Agriculture. His eldest son, Dr. Noel J. G. Smith, was appointed in 1926 to the Chair of Botany at Grahamstown in succession to Dr. S. Schonland.

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A. D. C.

**Fifth International Botanical Congress, 1930.**—The following Circular with regard to the International Botanical Congress has been received from Dr. Briquet, and it is printed here in order to call attention to the date by which motions should be sent to the Rapporteur général.

FIFTH INTERNATIONAL BOTANICAL CONGRESS  
CAMBRIDGE, 1930.

Motions on the subject of Nomenclature for consideration by the Congress should be in the hand of the Rapporteur général, Dr. John Briquet, before September 30, 1929.

Motions must be presented in the form of additional articles (or amendments) to the Rules of 1905-1910, drawn up in the form adopted in the International Code, and must be drafted as briefly as possible in Latin, English, French, German, or Italian. At least 100 printed copies must be presented.

According to the decisions of the Brussels Congress 1910, only motions relating to new points which were not settled in 1905 and 1910 can be presented. Motions which do not answer to these conditions shall only be discussed if the Cambridge Congress 1930 decides to take them into consideration.

For further information about the programme of work for nomenclature, apply to the Rapporteur général, Dr. John Briquet, Conservatoire botanique, Geneva (Switzerland).

**The Plant-Life of the Balkan Peninsula\*.**—This is the first of a series of Monographs of Plant Geography published by the Clarendon Press, Oxford. The author has had considerable field experience in many parts of the Peninsula and deals with his subject on a wide and modern basis. The opening chapters describe the physical features, geology, and climate of the area. Ecological aspects are dealt with in seven subsequent chapters and one chapter is devoted to the cultivated crops. The remaining six chapters are phytogeographical in the widest sense.

Of particular importance is the chapter on Duration and Life-Forms, in which the whole flora of the Balkan Peninsula is analysed by means of Raunkiaer's system and also by a system specially prepared by the author. The coincidence and contrast of different biological spectra leads to some important conclusions. A chapter on Plant Succession introduces new concepts into the study of the vegetation of the area, and a long chapter deals very fully with the influence of man on the Flora and Vegetation. The flora has been very carefully analysed and the results are summarized for each family by methods quite new in phytogeography. Later chapters deal with the distribution of the flora both within and outside the

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\*The Plant-Life of the Balkan Peninsula, A Phytogeographical Study, by W. B. Turrill. Clarendon Press, Oxford, 1929, pp. 490 + xxiv, plates 10, maps 11. With an Editor's Preface by Prof. A. G. Tansley, F.R.S. Price 30/-

Balkan Peninsula. The area is divided into convenient units for purposes of analysis and a final scheme of botanical subdivisions is proposed. The relationships of the flora and vegetation to those of surrounding countries are traced, and the author indicates the outstanding resemblances and contrasts and the probable history of the flora. He points out the probable methods of evolution of different genera, lines of migration, and areas where *in situ* development has been particularly great. A full account is given of the endemic and relict species in which the Peninsula is so rich. The 'Age and Area' hypothesis as applied to the flora of the area is given very critical consideration and is then applied, with interesting but varying results, to certain groups of plants.

The book forms the first attempt to describe the whole of the Balkan Peninsula from the botanical standpoint, and it may well serve as a model for future volumes. The author, who has worked laboriously on his task for upwards of ten years, is to be warmly congratulated on its successful issue. The book is excellently printed by the Clarendon Press and its general format makes it a handsome volume.

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**Flora of Trinidad and Tobago.\***—The appearance of the first two parts of this greatly needed Flora, issued by the Department of Agriculture, Trinidad and Tobago, is very welcome. The manuscripts were prepared in Trinidad by the Department and later checked at the Kew Herbarium, and the work will continue on these lines, appearing in small parts at intervals. The present parts consist of the first part of Volume i, which is to be devoted to the *Polypetalae*, comprising the Ranalian Cohort with the families *Ranunculaceae-Nymphaeaceae*; and the first part of Volume ii (*Gamopetalae*), dealing with the *Rubiaceae*. Keys to the families, genera and species are provided. The specific descriptions are of varying length, being longer when a species is described for the first time, and are followed by the distribution of the species within the area and its range outside it. The vernacular and local names of species are given when known, but full synonymy is not attempted, and collectors' numbers are only cited under the rarer species. Notes of taxonomic interest appear here and there, particularly in the part dealing with the difficult family *Rubiaceae*, in which much revision has been necessary. The authors of these parts are to be congratulated on the care and courage with which they have made this useful beginning.

**Crantziola versus Lilaeopsis.**—In Bull. Soc. Nat. Mosc. 1915, n.s. xxix. 124 (1916) Koso-Poliansky adopted the generic name *Crantziola* F. Muell. (Syst. Cens. Austral. Pl. 63 : 1882) in place of

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\*Flora of Trinidad and Tobago, Vol. i, Part 1, pp. 1-22, Ranales, by R. O. Williams, price 1s.; Vol. ii, Part 1, pp. 1-48, Rubiales, by R. O. Williams and E. E. Cheesman, price 2s. Trinidad: printed by the Government Printer, Government Printing Office, Port of Spain.

*Lilaeopsis* E. L. Greene (*Crantzia* Nutt.) on the ground that it is the earliest valid name for the genus in question, and he also transferred four species of *Lilaeopsis* to *Crantziola*.

The publication of the name *Crantziola* by F. Mueller was not effective as it appeared in synonymy (Art. 37, 38). Mueller himself actually adopted *Crantzia* Nutt. in both editions of his "Systematic Census of Australian Plants" (1882 and 1889), and in his "Key to the System of Victorian Plants," ii. 27 (1885) and i. 55, 265 (1887-8). The effective publication of *Crantziola* therefore dates from 1916, when Koso-Poliansky actually adopted it. As the generic name *Lilaeopsis* was effectively published in 1891, *Crantziola* Koso-Pol. is invalid, and *Lilaeopsis* stands.

F. Mueller in several instances suggested new names which he did not himself adopt. These are now-a-days regarded as non-valid—*vide* Sprague in Journ. Bot. 1922, 137, 315. "A new name should not be regarded as valid unless it is proposed unequivocally and unconditionally."

M. L. GREEN.

**Florae Siamensis Enumeratio.\***—When part 2 of this compilation was issued it was anticipated that only one more part would be needed to complete the *Polypetalae*: this expectation is, however, wide of the mark, as the present part comprises only the *Connaraceae* (8 pages) and the *Leguminosae*.

C.E.C.F.

**The Unconventional Garden.†**—Sir Arthur Hort occupies a prominent place amongst contemporary amateur gardeners, and his book, recently published under the above title, is sure to be welcomed by a large number of cultivators of plants. His interest in gardening, whilst no doubt of a sufficiently catholic nature, appears to be centred more especially in herbaceous and rock garden plants, although he turns a kindly eye in his book occasionally towards certain shrubs. One gathers that the space he has available for gardening is not large enough for him to be able to accommodate things that take up much room.

The first part of the book he describes as "The Calendar," and in this he discusses his favourite plants as they show their beauties month by month, recounting his successes or difficulties with them, their idiosyncracies, and giving many interesting details of the places where they grow in nature and the conditions under which they exist there. The second part is entitled "Plants and their Places," which is sufficiently indicative of its character. It includes a very excellent chapter on Irises and others equally attractive and interesting on the "Rock Garden" and "Wild Corners."

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\*A list of Plants known from Siam with Records of their Occurrence, by W. G. Craib. Published for the Siam Society by the Bangkok Times Press Ltd., Bangkok. Luzac & Co., London, 1928, pp. 359-561, Part 3. Price 12s. 10d.

†The Unconventional Garden, by Sir Arthur F. Hort, Bart., M.A. London, Edwin Arnold & Co., 1928, pp. viii. + 280. Price 10s. 6d.



Not only is all this written with a simple charm and an absence of adjectival exuberances that is very welcome in comparison with some recent efforts in a similar kind of literature; it is, besides, so full of cultural information that it must be of the greatest practical value to all those of its readers who are concerned with the plants the author loves and grows so well.

W. J. B.

**Dicymbe corymbosa** *Spruce ex Benth.*—With reference to this species (*see Kew Bull.* no. 9, 1928, pp. 371-4), the following extract from a letter received from Mr. B. R. Wood, Conservator of Forests in British Guiana, is of interest :—"With regard to the very interesting identifications of *Dicymbe* I note that *D. Altsoni* is described as a large tree reaching a height of 90 feet; whilst *D. Jenmani* was noted as only 8 feet or more, and *D. corymbosa* was said by Spruce to be normally from 10 to 15 feet in height and in rare instances to attain to 30 feet.

*D. corymbosa* may well be as described by Spruce on the Rio Uaupes, but this is certainly not the case in British Guiana, where Hohenkerk passed through considerable areas where the tree is dominant on the Potaro Railway Survey, and notes it as a large tree. Mr. Hohenkerk states that he would consider the average height of the trees to be from 70 to 90 feet. Where the Forestry Department Expedition passed through areas of this forest we found the tree had a very peculiar habit. It grew as a straight, moderately tall tree of good log form with smooth bark, to a height often of 90 feet (my estimate) or 100 feet (T. A. W. Davis' estimate), when it would commence to go very unsound a few feet from the base. Meanwhile just above the root collar it would be producing a number of small epicormic branches looking like coppice shoots. The old tree would then fall down and these shoots would go ahead very quickly, more being produced at intervals, until the tree had become what looked like a clump of coppice. Hohenkerk notes measuring such a clump on the Potaro Railway Survey where the shoots emerged at about six feet from ground level, they were thirteen in number varying from 8 inches to 14 inches in diameter. In this phase of its growth the clumps attain a height from about 50 to 70 feet. Another surprising feature is that these clumps form pure forest over considerable areas, which are devoid of undergrowth, this with a rainfall of some 120 inches, 5 degrees north of the Equator."

**Triana's Flora Neo-Granadina.**—The title of this work was included in Pritzels's Thesaurus, ed. 2, 323 (1872) as follows : "Triana, José. Nuevos géneros e especies de plantas para la Flora neogranadina. Bogotá, imprenta del Neogranadino. 1854. 4. 28 p." It does not appear to be represented in London, nor has it been traced in any library Catalogue. The following particulars of some of the new plants described in it have been obtained by collating certain references to Colombian plants contained in papers by H.

Karsten in *Linnaea*, vol. xxviii (1856), and by Triana and Planchon in *Ann. Sc. Nat. sér. 4*, vol. xvii (1862). It was cited by Karsten as "Flora Granadina" and "Flora Neo-Granadina," and by Triana and Planchon as "Nuev. plant. para la Fl. N.-Granad." and "Nuev. gen. y esp., etc. (Bogota, 1854)."

Among the contents of the work were five new genera and one new species enumerated below, all bearing Karsten's name as joint author. What else it contained is unknown.

**Brotochromola** *Karst. et Triana* in Triana, op. cit. 11 (1854); Karst. in *Linnaea*, xxviii. 446 (1856); Triana et Planch. in *Ann. Sc. Nat. sér. 4*, xvii. 337 (1862), cited as a synonym under *Herrania* Goud. (Sterculiaceae).

**B. aspera** *Karst. et Triana*, l.c.—Cited as a synonym of *Herrania pulcherrima* Goud. by Triana et Planch. l.c.

**Burmeistera** *Karst. et Triana*, l.c. 13; Karst. l.c. 444 (Lobeliaceae).—At one time regarded as a section of *Centropogon* C. Presl, but recently restored to generic rank by Gleason.

**Codazzia** *Karst. et Triana*, l.c. 17; Karst. l.c. 426 (Bignoniaceae).—Now treated as a section of *Delostoma* D. Don.

**Loevigia** *Karst. et Triana*, l.c. 22; Karst. l.c. 434. (Melastomaceae).—Now reduced to *Monochaetum* Naud.

**Cephalotomandra** *Karst. et Triana*, l.c. 23; Karst. l.c. 429 (Nyctaginaceae).—Now regarded as a section of *Pisonia* L.

**Matisia castaño** *Karst. et Triana*, l.c. 24; Karst. l.c. 430; Triana et Planch. in *Ann. Sc. Nat. sér. 4*, xvii. 326 (1862).

T. A. S.

**The Trees of New Zealand.\***—We have received from the State Forest Service, Wellington, New Zealand, a copy of a little book bearing the above title. The authors are Dr. L. Cockayne and Mr. E. Phillips Turner. The book owes its origin primarily to a desire to supply the delegates of the Third British Empire Forestry Conference, 1928, with a brief account of the indigenous forests of New Zealand and with short descriptions of most of the species that compose them. For a work running to 171 pages only, two-thirds of the space of which is given up to illustrations, the descriptive matter, although necessarily condensed, is commendably adequate. More than a hundred species are illustrated by a flowering or fruiting spray, and accompanying each illustration is a brief description and

\*The Trees of New Zealand, W. A. G. Skinner, Government Printer, Wellington, New Zealand, 1928. Price four shillings.

an indication of the habitat of the tree. The work is a very creditable production and should be greatly appreciated by people in New Zealand who are interested in the wonderful vegetation of that country. It is worth a place also on the bookshelves of horticulturists in the British Isles whose gardens are situated in the milder counties, where many New Zealand trees and shrubs succeed so well.

**Mesembryanthemum and allied Genera.\***—This work consists largely of notes previously published by the author in "South African Gardening and Country Life," and collected together in book form they make a very useful and interesting volume. After the introduction there is a chapter with coloured as well as black-and-white illustrations, giving some of the more remarkable growth-forms. The next part is mainly concerned with descriptions of new and little-known species. A third chapter contains a list of the genera and species of *Mesembrieae* occurring on the Cape Peninsula, with two keys (one of which is based as far as possible on fruit-characters) to indicate how the genera may be distinguished. Finally there are descriptions in Latin of 100 new species of which 66 are published here for the first time, and many new combinations incidental to the work undertaken by the author.

Looking through the pages of her "Notes" the reader is struck by the painstaking care with which Mrs. Bolus has recorded her observations—colour of flowers, time of day when the flowers open, length of flowering time and season, habit and habitat, factors governing these, adaptations and devices for protection and conservation of water—the all important element, pollinating mechanisms, insect visitors, etc. The volume should draw attention to an interesting field so profitably being explored not only by Mrs. Bolus but by Mr. N. E. Brown in England and Prof. Schwantes in Germany.

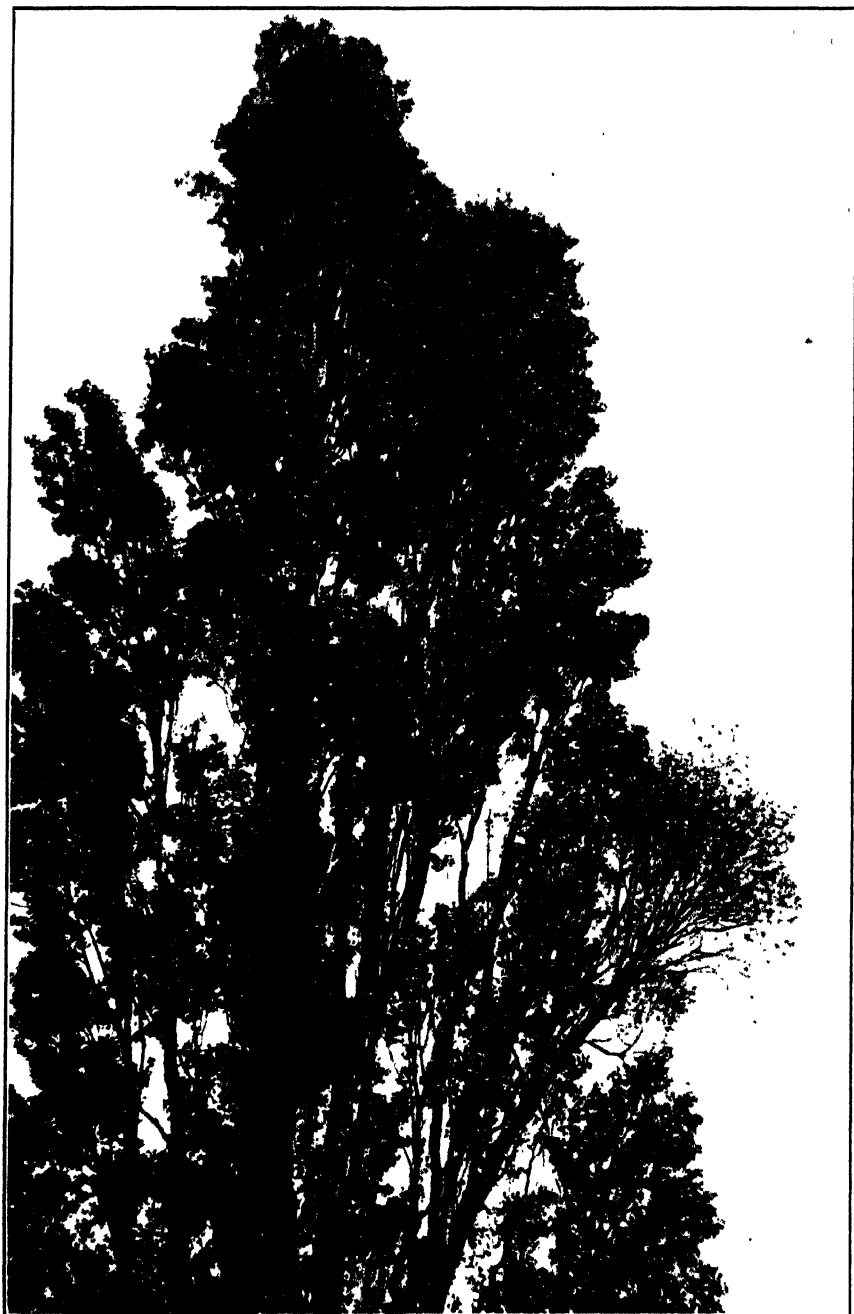
It is unfortunate that the coloured plates suffered in the reproduction by losing the brilliance of the originals, which is misleading to those not acquainted with the plants in their native habitat, but, on the other hand, this is compensated for by the fact that there are numerous figures which are exact as to detail. C. A. S.

**"A Sower."**—In the note recording the presentation of this statue (*K.B.* 1929, no. 2, page 63), we regret that the name of Sir Edwin Lutyens, R.A., was, through a misprint, transcribed as Sir Edward Lutyens.

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\*Notes on *Mesembryanthemum* and some allied Genera, by H. M. L. Bolus, Hon. Curator, Bolus Herbarium. Part 1, pp. 1–136, with 21 illustrations in colour and numerous figures in black-and-white. Speciality Press of South Africa Ltd., 1928 (price not stated).





Lombardy Poplar, Botanic Gardens, Christchurch, New Zealand,  
showing branch reverting to typical Black Poplar.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1929 ROYAL BOTANIC GARDENS, KEW

## XX.—FASTIGIATE AND PYRAMIDAL TREES.

W. J. BEAN.

Of the aberrant types of hardy trees, those with pendulous branches are probably the most popular in gardens, especially as isolated specimens on lawns. They are often indeed very attractive, particularly in association with the straight lines of buildings; some of them also make pleasant shady arbours for garden seats in summer time.

The value of fastigate trees, with their slender, erect, often rigid shape, on the other hand, resides entirely in the effect they produce in the landscape. On a level, uniform tract of land, like that of Kew, they fill an attractive role in relieving flat, comparatively low masses of vegetation. One cannot walk round the Gardens without feeling how much the landscape owes to the Lombardy poplar—the commonest and perhaps the best of them all. How greatly, for instance, the charms of the Lake are heightened by groups of this tree at the south-west end.

Nearly every common tree has produced a fastigate or at any rate a pyramidal "sport." The ash, the lime and the sycamore are exceptions and, except for a single tree at Aldenham, the common elm appears to be another. The genus *Ulmus* is, however, well represented in this respect by the Wheatley elm, one of the *U. nitens* group. There already exists in Kew a practically complete collection of these trees (apart from conifers), but they are growing in their respective collections and a general inspection of them would necessitate a rather lengthy pilgrimage. In view of the interest taken in them by tree-lovers at the present time, it has been thought desirable to assemble as many as possible in one readily accessible spot, so a commencement has been made on the western side of the Kew Palace Lawn, not far from the Sundial, where several trees of various kinds have recently been planted. To these it is proposed to add as occasion offers.

Fastigate trees are not planted so freely as they might be in small gardens in the outer suburbs of London and other cities, where space for the typical forms is not available. A selection of a few of the best would add greatly to the interest of such places, besides providing an agreeable diversity in the vegetation. They are also especially adapted for planting on the sides of roads, where there is insufficient space for the ordinary type of tree.

Although fastigate trees are usually and most conveniently propagated by grafting or by cuttings, some of them have the power of transmitting their distinctive peculiarity to their progeny raised from seed. The Cypress oak, for instance, raised from its own acorns, comes partially true, and the Lombardy poplar, although a male tree, has, by means of its pollen, transmitted its columnar shape in some measure to its hybrid offspring.

Whilst most fastigate and columnar trees are aberrant forms, a certain number of genuine species assume the same shape ; amongst them may be mentioned *Acer Lobelii*, *Libocedrus decurrens*, *Prunus Simonii*, *Ulmus stricta* (the Cornish elm), *Magnolia salicifolia* and *Acer glabrum*.

*Populus*. The commonest of all fastigate trees is the Lombardy poplar, *Populus nigra* var. *italica*. Its abundance is due to the facility with which it can be propagated by cuttings and its consequent cheapness, also to its easy cultivation and adaptability to different soils and climates. The facts of its origin are not precisely known and can now be only guessed at, but it seems to have appeared first on the banks of the river Po, probably (according to Henry) early in the eighteenth century. It is believed to have been introduced to England by the Earl of Rochford in 1758. It is now spread widely over the temperate regions of both hemispheres, attracting and pleasing the eye wherever it may be by its dominating height and slender shape.

It is similar to the ordinary black poplar, *P. nigra*, in leaf and twig, although occasionally pubescence may be found on the bark and leaf-stalks of vigorous young shoots. When young it has a tapering spire-like form, becoming columnar with age. The true Lombardy poplar is always male.

It was introduced to France in 1749 and eventually became popular as a road-side tree there. Lately it has given place in that country to some of the hybrid poplars. Writers of historical novels are occasionally guilty of an anachronism in describing it as lining the French roads in Plantagenet times. It is now being planted in considerable numbers along the new arterial roads of England in flat, low lying, moist localities, and in such places should provide very striking effects in a few years' time. A very frequent application to Kew is for advice in regard to the best tree to plant for hiding from view unsightly buildings or other objects that have suddenly sprung up within sight of the applicant's windows. For accomplishing this quickly, we are unable to recommend anything better than a double row of Lombardy poplars. They form a complete screen when in leaf, and although not so efficacious as an evergreen would be in winter, the branches are clustered so closely together that they make, even then, a useful screen. In good moist soil they are capable in their early years of increasing in height at the rate of six feet annually.

Although the true Lombardy poplar, as noted above, is a male, there are trees approximating it in shape which are female. There is one near Kew Palace which often sheds its cottony inflorescences during the summer ; it is not so slender in shape as the male and may have originated as a seedling from a female black poplar fertilised with the pollen of the Lombardy.

The Director informs me that he noticed a large Lombardy poplar in the Botanic Gardens, Christchurch, New Zealand, with a sporting branch high up on one side showing a loose, spreading branching like that of the ordinary black poplar. Photographs and specimens of the tree have been sent to Kew by Mr. James Young, Curator of the Christchurch Gardens. Mr. Young writes that he has struck cuttings from the sporting branch and that the plants, which are now three years old, do not show any signs of the fastigate habit.

As this occurrence appears to be unique, the photograph of the tree is reproduced. (Plate V.)

In Algeria the Lombardy poplar develops a remarkable white bark on the trunk and the same thing has been noticed in Asia Minor and Serbia. Mr. L. A. Dode, of Paris, has named these white-stemmed poplars *P. thevestina*, but they do not differ in botanical characters from the Lombardy poplar. The white bark is probably due to some climatic condition ; trees raised from cuttings brought from Algeria by the Director in 1910, and now growing in the collection of poplars, show very little development of this character as yet.

*P. nigra* var. *plantierensis* originated as a chance seedling in the nursery of Messrs. Simon-Louis at Metz. Similar in growth to the Lombardy poplar, it is distinguished by its pubescent leaf-stalks and young shoots, for which reason it is assumed to have originated as a hybrid between the Lombardy poplar and var. *betulifolia*, a variety of the black poplar marked by the same pubescence. A tree of var. *plantierensis* in the poplar collection is 38 feet high.

*P. alba* var. *pyramidalis*, "Bolle's White Poplar." Compared with the Lombardy poplar in mode of growth this tree, although quite fastigate, is considerably wider in proportion to its height. It is, of course, a form, differing only in habit, of the "Abele" or common white poplar. It appears to be of natural origin and to have first been noticed in 1841, "forming a little grove on the bank of a brook on the north side of the Karataw Mountains between Bokhara and Samarcand" (*Garden*, December 10, 1887, p. 543). A tree at Kew near the site of the Sun Temple was measured by Elwes and Henry in 1910 and was then 67 feet high ; they regarded it at that time as the finest in England. It is now well over 70 feet high with a trunk girthing 6 feet 9 inches. The pure white under-surface of the leaves gives a lively effect when they are moved by the wind and the tree may be regarded as one of the most ornamental of these fastigate trees.



*Acer saccharum* var. *monumentale* is a very distinct variety of the sugar maple, introduced from the United States to Kew in 1888. It is now 31 feet high and 2½ feet in girth of trunk. It is notable for its columnar shape due to the shortness of its side branches, which take an upward direction, but are not strictly fastigiate.

A maple of somewhat similar growth is *Acer Lobelii*, but this is a good species, native of South Italy. It is related to the Norway Maple (*A. platanoides*), of which it has, by some authorities, been made a variety.

*Aesculus Hippocastanum* var. *pyramidalis* is a well-marked form of common horse-chestnut, with stiffly erect branches. It is, however, of a broadly pyramidal shape and not at all columnar. There is a good example in the collection near the Refreshment Pavilion, 25 feet high.

*Alnus incana* var. *Balfourii*. We have recently received from Mr. F. R. S. Balfour a parcel of grafts with an accompanying letter dated April 5th, in which he says: "When in Norway two years ago, fishing in the Gloppen River, I found a tree of *Alnus incana* quite fastigiate and growing wild in a thicket. I marked it down and hearing that you are forming at Kew a separate collection of fastigiate trees, I wrote to Norway with the result that this package of twigs has been sent to me by Mr. Siversten of Sandané, Nordfjord." The twigs have been used both as grafts and as cuttings and we trust this interesting alder may be added to our collection in due course. It appears to be a quite new addition to fastigiate trees.

*Betula verrucosa* var. *pyramidalis*. This, the fastigiate white birch, is one of the most conspicuous trees in the collection at Kew. The best example, obtained from the nursery of Messrs. Dickson, of Edinburgh, in 1878, is 60 feet high, of slender columnar shape, with a trunk girthing 3 feet 2 inches. The variety is rarely seen in gardens, but is certainly worth planting as one of the most effective of fastigiate trees.

*Carpinus Betulus*. There are two fastigiate forms of the common hornbeam—*columnaris* and *pyramidalis*. Both are characterised by a thick clustering of erect branches and twigs, but the former is the more slender of the two and would make a useful street or wayside tree.

*Crataegus monogyna* var. *stricta*. This curious variety of the common hawthorn produces a dense head of erect branches which is very distinct from the typical tree. It can scarcely be called elegant, as its shape is in no way slender, but rather broad and massive. There are two trees, the larger 32 feet high, which have long been in the collection of thorns at Kew, and which flower with all the freedom of the common hawthorn.

*Castanea sativa* var. *pyramidalis*. The only form of sweet chestnut known to us that approaches the pyramidal shape is one which was found by the late Mr. W. Goldring in the grounds of Mount Mascal, Bexley, Kent. He obtained grafts for Kew and it is now represented in our collection by a young tree 22 feet high. It is not strikingly pyramidal, but its branching is erect enough to distinguish it amongst its allies.

*Fagus sylvatica* var. *fastigiata*, the Dawyck beech. The representatives of this beech at Kew have all been raised from grafts presented by Mr. F. R. S. Balfour, in whose garden at Dawyck, near Peebles, a tree has long been growing. It is the only old specimen known to us in the British Isles, and is figured by Elwes and Henry in "The Trees of Great Britain and Ireland," vol. vii. plate 406, under the varietal name *Dawyckii*. This name, however, must give place to the older one given above.

The Dawyck beech is a slender, strictly fastigate tree, and Mr. Balfour's specimen is over 50 feet high; except for a thick cluster of branches which give it a broad bushy base, it is very like a Lombardy poplar in form. The young trees at Kew, the largest of which is 30 feet high, are of even more slender shape. The leaves are smaller than those of common beech. Mr. Balfour informs us that his tree originated in the neighbourhood of Dawyck, and it possibly differs from the beech originally named *fastigiata* by Koch, which I have not seen.

*Koelreuteria paniculata* var. *fastigiata*. In April, 1888, Miss Corner, of The Grove, Hammersmith, sent some seeds labelled "*Koelreuteria paniculata*" to Kew with the information that they came from Shanghai. From them was raised a tree now growing in the collection of *Sapindaceae* near the Ruined Arch. It is 28 feet high and one of the most strictly fastigate trees in Kew, the spread of the branches being only 30 inches at the widest part. I can find no record of a fastigate *Koelreuteria* in the standard works of Elwes and Henry, Schneider or Rehder. It would seem probable, therefore, that this rather remarkable tree has originated at Kew.

*Liriodendron Tulipifera* var. *pyramidale*. All the forms of the tulip tree are interesting on account of the unique shape of the leaves amongst hardy trees, and this one, with its erect branches, is doubly so. It is a slow-growing tree compared with the type, and the largest one at Kew is only 22 feet high, although it has been grown in the collection of *Magnoliaceae* in the Berberis Dell for nearly thirty years. The finest tree known to me is in the old-established nursery of Messrs. Simon-Louis at Metz; when I saw it there over twenty years ago it was a shapely spire 30 feet high.

*Morus alba* var. *fastigiata*. This variety of white mulberry has a narrowly pyramidal shape and is further distinguished from the type by the leaves being often more than usually lobed. At Kew, like

other forms of white mulberry, its young shoots are almost invariably cut back by winter frost, and this depreciates its value as an ornamental tree.

*Prunus Lannesiana* var. *erecta*. This is a very curious form of the Japanese Cherry forming a cluster of perfectly erect stems. It is known to Japanese gardeners as "Amanogawa." The flowers are pale pink, single or semi-double, fragrant, and it has the distinction, rare among the Japanese Cherries at Kew, of producing occasionally quite good crops of small black fruits. Wilson describes it as "very beautiful," but I have not seen any trees in this country that deserve that epithet, although Mr. Lowinsky used to grow a goodly number of them in his garden at Tittenhurst, Sunninghill.

*Pyrus*. Fastigate trees belonging to this genus occur in the rowan (*P. Aucuparia*), and in *P. pinnatifida*, both of which are attractive trees in their ordinary shape. These varieties only differ in their narrow shape, but this may enable gardeners whose space is restricted to find room for them.

*Quercus pedunculata* var. *fastigiata*. This, the "Cypress Oak," occurs in a wild state in several localities in France and Spain, and a tree at Herrenhausen in Hesse Darmstadt, originally found in a forest there, was doubtless also of natural origin. This tree was described and figured in the *Gardeners' Chronicle* for 1842, p. 36, and measured at that time nearly 90 feet in height and nearly 12 feet in girth of trunk. It appears to have been the parent of many continental and English trees, but is probably no longer in existence. A fine specimen in the park at Wilhelmshöhe, near Cassel, which originated as a graft from this tree, is now over 100 feet high. There are several trees at Kew, the best of which is 55 feet high; it was planted in the collection of oaks in 1871, and in 1897 was about 45 feet high. It is not, therefore, a quick grower. The habit of the tree is slenderly columnar. As has been mentioned previously, it comes true to a small extent from seed, and some sub-varieties have been raised in this way; sub-var. *contorta* has its young branches crooked and twisted, and sub-var. *Grangei* is a seedling that has partially reverted to the type and thereby become pyramidal rather than columnar. Except that it is slow-growing, the Cypress oak would be useful as a roadside tree, especially where lateral space is restricted. In such a place it would not only make, eventually, as striking a feature as the Lombardy poplar, but would be likely to have a much longer life.

*Robinia pseudacacia* var. *fastigiata*. This remarkably distinct form of the common "Acacia" or "Locust tree" is one of the most slender in habit of all this class of tree. A good example in the collection of *Leguminosae* at Kew near the Pagoda is 55 feet high and only 8 feet in width. I do not know whether its origin is anywhere recorded, but it has been in existence for at least eighty years. It is nevertheless one of the rarest of these fastigate trees.

There is a variety of the common "Acacia," known as *monophylla*, in which the number of leaflets to each leaf is reduced often to one (but also to two or three). This also has sported into a fastigiate form (*monophylla fastigiata*). It is not so slender as the other.

Elms. The "Wheatley Elm," *Ulmus stricta* var. *Wheatleyi*, is the best known and most valuable of pyramidal elms and is now being extensively planted as a roadside tree. There are two forms in cultivation that differ in habit, one having a much closer, more erect branching than the other. The best tree at Kew, obtained from Messrs. Lee's nursery just fifty years ago, is now 60 feet high and 4 feet 4 inches in girth of trunk. An even finer one grows in the Terrace Gardens at Richmond. There is also a yellow-leaved form of the Wheatley Elm.

*Ulmus montana* has a variety called *fastigiata* that is commonly known as the "Exeter" elm, through having been found in or near that city by a Mr. Ford about 1826. There is a fine tree of it in the Vicarage garden at Bitton, near Bristol, 70 feet high. Its branches grow erect and the leaves, smaller than in the type, are often clustered at the end of the shoot. On the whole it is not particularly attractive.

The commonest and best known of all evergreen fastigiate trees is the Irish yew, which, as is now well known, was first found in the mountains of Fermanagh about 1780. Presumably it was of natural origin and grew from seed on the spot where it was discovered, but it is curious that two plants of the same mode of growth were found. Aberrant forms of seedling origin usually come as individuals. Both the wild plants were transplanted, one to the garden of the man who found them, the other to Florence Court. The former died, but the latter still lives and is the ultimate source, no doubt, whence most or all of the Irish yews that now exist were derived. In the young state the plant is of columnar form, but with age becomes broad at the top, sometimes of an inversely pyramidal shape. In old gardens it has often been planted in avenues or formal arrangements, but although entirely distinct from any other tree, the effect of a number of specimens in association is rather dismal. It has sported into a sub-variety with golden young leaves called *fastigiata aurea*.

The Florence Court yew is a female and its flowers, when fertilised with pollen from common yew, have produced seed from which plants have been raised, that show its influence in an intermediate type of growth. The variety called *cheshuntensis* is one of them.

In the *Kew Bulletin*, 1927, p. 254, there is an account of the discovery by Mr. W. H. B. Fletcher, of Aldwick Manor, Bognor, of a considerable number of male plants of Irish yew growing in his neighbourhood. All of them appear most probably to have been obtained from the Barnham Nurseries Ltd., near Bognor, where Mr. Fletcher found, in 1927, some male specimens of the golden form still in nursery quarters. But how or whence the firm originally acquired them is no longer ascertainable.

Another and fairly well-known member of the Yew family, fastigate in growth, is *Cephalotaxus pedunculata* var. *fastigiata*. It is of Japanese origin and was introduced from that country in 1861. Like the Irish yew it is columnar in youth, but becomes broad-topped with age. It is, of course, very distinct in its larger, longer leaves.

Two very well-known fastigate trees amongst conifers are *Cupressus macrocarpa* var. *fastigiata*, a form of the "Monterey Cypress," and *C. sempervirens* var. *stricta*, the "Italian Cypress." Both these are much better known in gardens than the types from which they have sprung, and both of them survive our winters at Kew, although they are not really vigorous here. This may be due, however, more to atmospheric influences than to climatic ones. A few trees of a form of the Italian Cypress recommended to us some years ago as being more hardy than the ordinary form have been planted on the south side of King William's temple. They are of very slender shape, have grown well and up to the present have justified their recommendation. To travellers in Italy and other parts of South Europe the dark slender spires of this tree constitute one of the most abiding memories.

The fastigate form of *C. macrocarpa* is much grown in the milder parts of Britain. It grows very rapidly, makes a useful wind-break, and it is sometimes used to form tall hedges.

Of Lawson Cypress (*Cupressus Lawsoniana*) there are several erect-growing, slender varieties, the most popular of which are *Allumii*, spire-like in shape and wholly glaucous; *erecta viridis*, green and much more vigorous, and, in places where the Italian Cypress is too tender, a good substitute for it. Even better, perhaps, is the var. *Drummondii*, admirably represented in Mr. Neville Cooper's pinetum near Canterbury, but apparently very uncommon.

A slender columnar variety of *Thuya plicata*, called *fastigiata* or *pyramidalis*, is a distinct and quite attractive form. It is represented at Kew by a tree 35 feet high.

*Abies pectinata* var. *pyramidalis* is a spire-like tree of arresting shape and appearance, but, like its type, it refuses to exist in the lower Thames Valley. There used to be (perhaps is now) a fine example of it in Lavallée's Arboretum at Segrez in France; it was 35 feet high when I saw it there over twenty years ago. There is a similar variety of common spruce—*Picea excelsa* var. *pyramidata*—which makes a slender pyramid.

Three forms of common juniper are to be included in this group of trees, viz., *Juniperus communis* var. *hibernica*, *J. c.* var. *suecica* and *J. c.* var. *compressa*. The two former are similar in their tall, slender, columnar shape, and by some authorities are considered identical, but *suecica* is kept separate by nurserymen on account of the pendulous terminal twigs. The variety *compressa*, of very slow

growth, is distinct from any other tree or shrub, forming as it does a dense mass of branches and silvery grey leaves of rigidly slender, erect shape; a plant may take twenty years to grow a little over one foot high. It makes an extremely effective little shrub for the Rock Garden.

## XXI.—CONTRIBUTIONS TO THE FLORA OF SIAM.\* ADDITAMENTUM XXVI.

**Talauma siamensis** Dandy [Magnoliaceae-Magnolieae]; a *Talaumae* speciebus aliis duabus in Siam peninsulari adhuc inventis differt, a *T. betongensi* Craib carpellis multo paucioribus, a *T. Candollei* Blume omnibus partibus (gemmis axillaribus exceptis) glabris.

*Arbor* parva, circa 8 m. alta (ex Kerr); ramuli glabri; gemmae axillares adpresse fulvo-pubescentes. *Foliorum* lamina plus minusve elliptico- vel lanceolato- vel oblanceolato-oblonga, basi cuneata vel rarius obtusa, apice rotundata vel obtusa vel acuta vel breviter acuminata, interdum leviter emarginata, usque ad circa 27 cm. longa et 10 cm. lata, tenuiter coriacea vel coriacea, glabra, in sicco utrinque manifeste reticulata, nervis lateralibus utrinsecus circa 12-16 subtus conspicue prominentibus; petiolus usque ad circa 2.5 cm. longus, glaber. *Alabastrum* ovoideo-ellipsoideum; bractee spathoideae, glabrae; pedunculus crassus, circa 1-2 cm. longus, glaber. *Perianthium* 3-merum; tepala 9, glabra, 3 exteriora obovato-oblonga, circa 3.5-4 cm. longa. *Antherae* connectivum ultra loculos in appendicem longulam peracutam productum. *Gynaecium* subellipsoideum; carpella circa 7-10, glabra. *Fructus* immaturus (et verisimiliter maturus) subellipsoideus; carpella matura crasse lignosa, rostrata, usque ad circa 4.5 cm. longa, rostro apicali longulo acuto.

Chumpawn, Siepyuan, *Put* 936 (*type*); 50 m., evergreen forest, Kerr 11644.

**Magnolia Craibiana** Dandy [Magnoliaceae-Magnolieae]; inter *M. coco* DC. speciesque affines ponenda, quarum ad *M. coco* et *M. pulgarensis* Dandy ob glabritatem proxime accedit sed ab utraque foliis apice obtusis rotundatisve nec acuminatis facile distinguenda.

*Arbor* parva, circa 8 m. alta (ex Kerr), omnino glabra, ramulis iunioribus apicem versus glaucescentibus. *Folia* persistentia; lamina elliptico- vel ovato- vel lanceolato-oblonga, basi cuneata, apice obtusa vel rotundata, interdum leviter emarginata, usque ad circa 14 cm. longa et 6 cm. lata, tenuiter coriacea, in sicco utrinque conspicue reticulata, nervis lateralibus utrinsecus circa 10-15 subtus satis prominentibus; petiolus interdum longitudinis circa 2 cm. attingens sed plerumque infra 1.5 cm. longus, superne usque ad apicem cicatrice stipulari notatus; stipulae petiolo adnatae. *Alabastrum*

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\*Continued from *K.B.* 1928, p. 247.

lanceoloideo- vel anguste ellipsoideo-oblongum, iuvenile in bracteis spathoideis pluribus extus glaucescentibus inferioribus mox deciduis inclusum; pedunculus erectus vel suberectus, subgracilis, circa 1-1.5 cm. longus, glaucescens, bractearum cicatricibus notatus. *Perianthium* 3-merum; tepala 9, subsimilia et subaequalia, 3 exteriora plus minusve elliptico-oblonga (ex alabastro), 6 interiora basi angustiora. *Staminis* filamentum brevissimum, crassum; anthera linearis, introrse dehiscens, connectivo ultra loculos in appendicem brevem acutam producto. *Gynaecium* sessile, subellipsoideum; carpella circa 11, glabra.

Nakawn Sritamarat, Kao Luang, 1400 m., evergreen forest, Kerr 15537.

In the absence of mature fruit it is impossible to be certain whether this plant is a *Magnolia* or a *Talauma*, but from the appearance of the material its affinities seem to be closest with the section of *Magnolia* which includes such species as *M. coco* DC., *M. Championii* Benth., *M. pulgarensis* Dandy, and *M. pachyphylla* Dandy.

**Pygeum ferreum** Craib [Rosaceae-Pruneae]; a *P. floribundo* Koehne lenticellis haud conspicuis, foliis minoribus eorumque nervis lateralibus pagina superiore haud impressis recedit.

*Arbor* circa 8 m. alta (ex Kerr); ramuli iuventute angulati, ferrugineo-tomentosi, mox teretes, glabri, cortice cinereo-brunneo vel subcinereo obtecti, lenticellis haud numerosis parum elevatis. *Folia* lanceolato-ovata vel subovata, apice subacuta, costa excurrente apiculata, basi rotundata vel late cuneata, usque ad 10.5 cm. longa et 4.5 cm. lata, rigide chartacea, sicco supra fusciscentia, subtus subferruginea, matura supra ad costam tomentella, aliter glabra, subtus ad costam tomentella, aliter glabra vel ad nervos nervulosque parce pilosa, paulo supra basem glandula solitaria transverse elliptica sessili utrinque instructa, nervis lateralibus utrinque 8-10 intra marginem anastomosantibus, supra sat conspicuis subtus prominentibus, margine integra, saepissime parum revoluta, petiolo ad 15 mm. longo primo ferrugineo- cito cinereo-tomentello suffulta; stipulae fugaces. *Racemi* e nodis infra folia orti, 3-6-fasciculati, rhachi pedicellis et receptaculo densius ferrugineo-tomentellis; pedicelli inferiores ad 12 mm. longi; bractee cito deciduae, 2.5 mm. longae, oblongae, dorso margineque ferrugineo-pubescentes; flores albi, odorati (ex Kerr). *Receptaculum* circa 3 mm. longum, intra basi et apice pilosum. *Sepala* deltoidea, acuta, ad 1.3 mm. longa, dorso ferrugineo-pilosa. *Filamenta* ad 3.5 mm. longa, inferne pilis paucis sat longis instructa, antheris anguste oblongis ad 1 mm. longis. *Ovarium* dense hirsutum, 2 mm. altum, ovulis duobus pendulis; stylus 5 mm. longus, inferne pilis perpaucis instructus, superne parum unilateraliter sulcatus; stigma obliquum, unilateraliter canaliculatum.

Nakawn Sritamarat, Kao Luang, 1300 m., evergreen forest, Kerr 15501.

**Rubus angkae** *Geddes* [Rosaceae-Rubeae] ; a *R. moluccano* Linn. foliis altius lobatis, lobis angustioribus, stipulis fimbriis multo brevioribus recedit.

*Frutex* scandens ; ramuli steriles iuventute dense ferrugineo-pilosi et aculeis rectis subsparse instructi, floriferi sparius pilosi et aculeis brevioribus instructi, mox glabri vel fere glabri, parum striati, cortice brunneo vel pallide brunneo obtecti, lenticellis obscuris. *Folia* ultra medium palmatim 5-lobata, ambitu subrotundata, basi cordata, 10–17 cm. diametro, lobis lanceolatis vel anguste oblongo-lanceolatis apice acutis vel acute subacuminatis, mediano 7–14 cm. longo 2.5–3.5 cm. lato, basalibus interdum iterum lobulatis, chartacea, supra primo bullata, setulosa et ad costas dense pubescentia, matura laevia, ad costas dense pubescentia, aliter glabra, subtus primo dense adpresse pilosa, matura pallide cinnamea, ad costas nervosque sparse pilosa vel pubescentia, aliter dense arachnoidea, e basi 5-costata, costis supra conspicuis vel parum impressis subtus prominentibus, nervis loborum lateralibus utrinque ad 10 intra marginem anastomosantibus supra impressis subtus prominentibus, nervulis reticulatis supra impressis subtus prominulis, margine denticulata, petiolo 4–7 cm. longo sparse aculeato maturo piloso vel sparse piloso suffulta ; stipulae circa 1 cm. longae et 6 mm. latae, pinnatim fimbriatae, deciduae, dorso pilosae. *Glomeruli* et axillares, petiolo multo breviores, et in ramulis terminalibus et axillaribus aphyllis dispositi ; pedicelli breves vel usque ad 1 cm. longi, pubescentes et dense arachnoidei ; flores albi (ex *Kerr*). *Receptaculi* tubus circa 2 mm. longus, dorso primo densius ferrugineo-pilosus, intra basi hirsutus. *Sepala* lanceolata, acuta vel apice 3-dentata, ad 8 mm. longa et 3.5 mm. lata, dorso indumento ei receptaculi simili tecta, intra tomentella. *Petala* subobovata, apiculata, circa 7 mm. longa et 4 mm. lata, pagina utraque sparse subsericea. *Stamina* petalis breviora, glabra. *Carpella* glabra, reticulata, stylis circa 4 mm. longis.

Doi Angka, 1000 m., clearing by stream, *Kerr* 5283.

**Rubus ferreus** *Geddes* [Rosaceae-Rubeae] ; a *R. birmanico* Hook. f. foliis longius pilosis, margine minutius denticulatis, floribus densissime tomentosis differt.

*Frutex* scandens ; ramuli primo molliter et patenter pilosi et hirsuti. *Folia* ambitu rotundata, palmatim 5-lobata, lobis apice acutis, basi cordata, 6–8 cm. longa, 7–9.5 cm. lata, supra sicco ferruginea, rugulosa, pilosa, subtus molliter pilosa, nervis 5 e basi radiantibus pagina superiore conspicuis inferiore prominentibus, margine bidenticulato-serrata, ciliata, petiolo circa 6 cm. longo piloso et hirsuto suffulta ; stipulae laciniatae, pilosae, laciniis pectinatis. *Cymae* axillares et terminales, congestae, sericeo-pilosae ; pedicelli circa 4 mm. longi, tomentosi ; bractae laciniatae, molliter pilosae. *Receptaculum* sericeo-pilosum ; discus prope carpella hirsutus. *Sepala* 5, lanceolata, nonnulla integra, nonnulla apice pinnatifida, circa 9 mm. longa. *Petala* 5, alba (ex *Kerr*), rotundata vel obovata,



venata, 7-8 mm. longa. *Filamenta* subulata, 2.5-4 mm. longa, glabra, antheris 0.6 mm. longis. *Carpella* glabra; styli tenues, 5-6 mm. longi, glabri. *Fructus* ruber (ex Kerr).

Doi Angka, 2400 m., more open spots of evergreen forest, Kerr 5310.

***Pyrus crenulata* Geddes** [Rosaceae-Pomeae]; a *P. cuspidata* Bert. foliis breviter acuminatis glabris, cymis laxioribus haud tomentosis, a *P. polycarpa* Hook. f. foliis latioribus minoribus, nervis numerosis, margine crenulata haud serrata differt.

*Arbor* circa 10 m. alta (ex Kerr), ramulis glabris iuventute brunneis mox nigris vel cinereo-nigris conspicue vel haud conspicue lenticellatis. *Folia* saepissime rotundato-ovata, apice acuminata, subacuta, basi truncata vel rotundato-truncata, 6-8.2 cm. longa, 3.7-5.4 cm. lata, chartacea, supra brunnea, nitentia, glabra, subtus pallidiora, glabra, nervis lateralibus utrinque 9 paginis ambabus conspicuis, crenulata, petiolo 2.3-3.2 cm. longo suffulta; stipulae cito deciduae. *Cymae* terminales, ad 6 cm. longae, laxae, glabrae; pedicelli ad 1 cm. longi, filiformi-bracteolati; bracteae deciduae. *Calycis* lobi 5, ovati, 2 mm. longi, 1.5 mm. lati, glabri. *Petala* 5, oblonga, apice obtusa, basi cuneata, 5 mm. longa, 3.75 mm. lata, glabra. *Stamina* biseriata, filamentis filiformibus, longioribus 6 mm. brevioribus 3 mm. longis, antheris oblongis 0.6 mm. longis. *Ovarium* 3-loculare, loculo quoque biovulato, glabrum; styli tres, 5 mm. longi, basi connati; stigmata capitata. *Fructus* globosus, 14 mm. diametro.

Korat, Kao Lêm, 1100 m., evergreen forest, Kerr 9937 (*type*), and 1300 m., scrub, Kerr 9937A.

***Raphiolepis fragrans* Geddes** [Rosaceae-Pomeae]; a *R. indica* Lindl. foliis oblanceolatis longioribus, receptaculo haud piloso recedit.

*Arbor* 8-10 m. alta (ex Kerr), ramulis glabris vel iuventute subpuberulis cortice primo rubro-brunneo mox griseo obtectis, lenticellis inconspicuis. *Folia* alterna, oblanceolata vel oblongo-oblanceolata, apice obtuse et breviter acuminata, basi cuneata, 7.5-9.8 cm. longa, 2-3.5 cm. lata, supra viridia, nitentia, primo medio parce pilosa, cito glabra, subtus pallidiora, glabra, nervis lateralibus utrinque circa 10 supra prominulis subtus conspicuis, costa subtus prominente, margine distanter anguste serrata, revoluta, petiolo 1-1.8 cm. longo primo piloso cito glabro suffulta. *Inflorescentia* terminalis, cymosa; pedicelli 8-12 mm. longi, puberuli. *Receptaculum* parce pubescens. *Sepala* longe deltoidea, subacuta, 4 mm. longa, dorso praesertim ad marginem pubescentia. *Petala* 5, alba (ex Kerr), obovata vel late oblonga, apice emarginata, basi cuneata, 8 mm. longa, 5.5 mm. lata, brunneo-pilosa. *Stamina* numerosa, biseriata, filamentis filiformibus 3.5 mm. et 7 mm. longis, antheris oblongis 0.8 mm. longis. *Ovarium* glabrum, 2-loculare,

loculis 2-ovulatis; styli 2, parte inferiore connati, 8 mm. longi, partis liberae ad basem pubescentes; stigmata parva.

Kemarat, 100 m., evergreen forest, *Kerr* 8257A (*type*). Surin, Sanka, 100 m., light evergreen forest, *Kerr* 8257.

**Raphiolepis Kerrii** *Geddes* [Rosaceae-Pomeae]; a *R. japonica* Sieb. et Zucc. foliis longioribus, inflorescentia haud tomentosa differt.

*Arbor* circa 7 m. alta (ex *Kerr*); ramuli iuventute parce pubescentes, brunnei, nitentes, mox glabri, grisei, lenticellis inconspicuis. *Folia* alterna, oblanceolata vel late oblanceolata, apice subito et breviter acuminata, basi cuneata vel acuminata, 6.5-11.5 cm. longa, 1.8-4 cm. lata, supra viridia vel sicco brunnescentia, nitida, primo medio densius pilosa, cito glabra, subtus glabra, nervis lateralibus utrinque circa 10 haud conspicuis, costa subtus prominente, margine integra vel rare et inconspicue serrata, revoluta, petiolo 1.5-1.8 cm. longo primo piloso cito glabro suffulta. *Cymae* terminales, 5-6 cm. longae, pedunculis pubescentibus; pedicelli circa 2 mm. longi, apice bibracteolati, basi articulati. *Receptaculum* extra puberulum. *Sepala* 5, deltoidea, subacuta, 2.5 mm. longa, extra puberula, intra et ad marginem ferrugineo-pubescentia. *Petala* 5, alba (ex *Kerr*), apice emarginata, basi cuneata, 7.5 mm. longa, 4.5 mm. lata, glabra. *Stamina* numerosa, biseriata, filamentis subulatis, longioribus 5.5 mm. longis, brevioribus 3 mm. longis, antheris oblongis 0.8 mm. longis. *Ovarium* glabrum, 2-loculare, loculis biovulatis; styli 2, basi inter se connati, 6 mm. longi, glabri; stigmata parva.

I.6i, Kao Krading, 1200 m., open evergreen forest, *Kerr* 8689.

**Eriobotrya stipularis** *Craib* [Rosaceae-Pomeae]; ab *E. bengalense* Hook. f. stipulis foliaceis saepe persistentibus, bracteis persistentibus, stylis fere ad medium inter se connatis recedit.

*Arbuscula* circa 6 m. alta (ex *Kerr*); ramuli cito glabri, cortice brunneo vel cinereo-brunneo mox cinereo obtecti, lenticellis haud numerosis. *Folia* saepissime oblongo-oblanceolata, rarius late lanceolata vel late oblanceolata, apice acuminata, acuta vel obtusa, basi cuneata, interdum parum inaequilateralia, latere altero acuminata, altero cuneata, 9-18 cm. longa, 3.5-7 cm. lata, subcoriacea, sicco viridia, subtus parum pallidiora, pagina utraque glabra, nervis lateralibus utrinque circa 10 supra conspicuis vel parum prominulis subtus prominulis ad marginem currentibus vel saepissime intra marginem furcatis ramulis ad marginem currentibus, nervis transversis numerosis inter se plus minusve parallelis pagina utraque conspicuis vel subconspicuis, margine nisi inferne crassius crenato-serrata, petiolo 1.5-2.7 cm. longo glabro suffulta; stipulae foliaceae, oblongae vel ellipticae, 6-13 mm. longae, 4-10 mm. latae, distincte stipitatae, pluricostatae, margine subintegrae vel saepissime serratae, subcoriaceae, diu persistentes. *Panicula* terminalis, sessilis vel breviter pedunculata, ad 8 cm. longa, ramulis lateralibus utrinque paucis simplicibus ad 6 cm. longis, tomento ferrugineo mox cinereo

tecta ; flores subsessiles vel pedicello ad 4 mm. longo suffulti ; bracteae saepissime persistentes, anguste oblongo-spatulatae, obtusae, sat crassae, 3 mm. longae, 1.5 mm. latae, dorso tomentellae, intra glabrae ; bracteola solitaria, bractea paulo minor, paululo supra pedicelli medium inserta. *Receptaculum* subpatelliforme, vix 5 mm. diametro. *Calycis* segmenta deltoidea, subacuta, circa 2 mm. longa et basi 2.5 mm. lata. *Petala* late ovata vel subquadrato-ovata, obtusa, ungui brevi lato incluso 4 mm. longa, 3 mm. lata, intra basem versus sparse pilosa. *Stamina* glabra, ad 4 mm. longa. *Discus* glaber, radiatus. *Styli* 4.5 mm. longi, paulo ultra medium bilobati, nisi superne pilosi, stigmatibus parvis obliquis ; ovarium biloculare, ovulis per loculo 2 erectis.

Satul, Adang, 500 m., on rocky ridge, *Kerr* 14125.

***Polyosma adangensis*** *Craib* [Saxifragaceae-Escallonieae] ; ab affini *P. ilicifolia* Blume pedicellis multo brevioribus inter alia recedit.

*Arbor* circa 7 m. alta (ex *Kerr*) ; ramuli primo fusci, breviter adpresse pubescentes, mox glabri, cortice cinereo vel brunneo-cinereo obtecti, lenticellis haud conspicuis. *Folia* oblanceolata vel oblongo-oblanceolata, apice acuminata, costa excurrente apiculata, basi cuneata, 5-10 cm. longa, 2.4-3.5 cm. lata, rigide chartacea, sicco fuscescentia, subtus parum pallidiora, supra glabra vel ad costam hic et illic parce puberula, subtus ad costam nervosque laterales, rarius aliter, sparse adpresse pubescentia, costa supra impressa subtus prominente, nervis lateralibus utrinque 10-12 intra marginem anastomosantibus supra conspicuis vel subconspicuis subtus prominulis, margine rarissime integra, saepissime apicem versus plus minusve crassius pauci-denticulata, petiolo 8-15 mm. longo subterete plus minusve adpresse pubescente suffulta. *Inflorescentia* terminalis, pedunculo communi circa 2 cm. longo incluso circa 10 cm. longa, rhachi simplice ut ramulis pubescente ; pedicelli sub anthesin vix 2 mm. longi, subsericei, apice bracteolis 3 brevibus instructi ; flores albi (ex *Kerr*). *Receptaculum* 1.5 mm. longum, subsericeum. *Calyx* circa 1 mm. longus ; tubus brevis ; lobi late deltoidei, acuti. *Petala* linearia, obtusa, 7.5 mm. longa, basem versus 1.75 mm. lata, pluricostata, dorso pilis brevibus sericeis adpressis subsparse instructa, intra nisi inferne pilosa. *Filamenta* sat crassa, 4 mm. longa, pilosa, antheris linearibus 3 mm. longis. *Stylus* 6.5 mm. longus, papillosus.

Satul, Adang, 600 m., evergreen forest, *Kerr* 14142.

***Polyosma arguta*** *Craib* [Saxifragaceae-Escallonieae] ; a *P. conocarpa* Ridl. et *P. mutabile* Blume endocarpium iugis acutis, foliis obsolete denticulatis recedit.

*Arbor* circa 7 m. alta (ex *Rabil*) ; ramuli novelli densius adpresse fulvo-pubescentes, mox fusci, sparsius adpresse pubescentes, demum pallide corticati. *Folia* oblongo-oblanceolata, oblongo-lanceolata, vel suboblanceolata, apice obtuse acuminata, basi cuneata, interdum

inaequilaterialia, 12–19 cm. longa, 3·8–6 cm. lata, chartacea, sicco supra fuscuscentia, subtus subviridia, supra ad costam puberula, aliter glabra, subtus ad costam nervosque laterales breviter adpresse pubescentia, aliter pilis adpressis sparse instructa, vel fere glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 10–12 intra marginem anastomosantibus supra plus minusve conspicuis subtus subprominentibus, nervulis supra subobscuris subtus subprominulis, margine obsolete vel hic et illic conspicue denticulata, rarissime integerrima, petiolo ad 1·5 cm. longo indumento ei ramulorum simili tecto suffulta. *Infructuscentia* terminalis, pedunculo communi ad 2 cm. longo incluso circa 12 cm. longa, rhachi tenuiter sericea; pedicelli circa 5 mm. longi, sericei vel sparse sericei, apice bracteolis tribus brevibus instructi; drupae sicco nigrae, ambitu oblongae vel suboblongae, stylo basi persistente apiculatae, calyce persistente coronatae, circa 1 cm. longae, basi 6 mm. diametro, endocarpio conspicue acute acuminato longitudinaliter 8-sulcato sulcis 2 lateralibus aliis altioribus iugis acutis vel subobtusis haud rotundatis.

Kaw Chang, Kao Faimai, *Rabil* 7.

**Polyosma bracteolata** *Craib* [Saxifragaceae-Escallonieae]; species nova ab aliis bracteolis elongatis, mediana receptaculo subaequilonga vel eo longiore, receptaculo sub anthesin saepe distincte canaliculato, filamentis antheris conspicue longioribus distinguenda.

*Arbuseula* circa 8 m. alta (ex *Kerr*); ramuli primo sericei, cito fusci, longitudinaliter striati, pilis brevibus adpressis sericeis sparse instructi, mox brunneo-stramineo-corticati, lenticellis vix conspicuis. *Folia* oblongo-oblanceaolata vel oblongo-elliptica, apice acuminata, costa excurrente apiculata, basi cuneata, haud rarius parum inaequilaterialia, 9·5–21 cm. longa, 3–6 cm. lata, sicco supra fuscuscentia, subtus fusco-viridia, chartacea vel rigide chartacea, supra glabra vel ad costam puberula, subtus ad costam nervosque laterales adpresse pubescentia, matura subglabra, nervis lateralibus utrinque circa 10–12 supra plus minusve conspicuis subtus subprominentibus intra marginem anastomosantibus, costa supra impressa subtus prominente, margine integra vel remote obsolete denticulata, petiolo 8–17 mm. longo sparse adpresse pubescente supra anguste canaliculato suffulta. *Inflorescentia* terminalis, pedunculo communi ad 2 cm. longo incluso ad 14 cm. longa, rhachi sparse breviter pubescente; pedicelli ad 2 mm. longi, subsericei, apice bracteolis tribus quarum mediana ad 2·5 mm. longa lateralibus circa 1 mm. longis dorso sparse subsericeis instructi. *Receptaculum* circa 1·25 mm. longum, breviter sericeum, saepe distincte canaliculatum. *Calyx* vix 1·5 mm. longus, tubo brevi, lobis late deltoideis subacutis, dorso sparse adpresse pubescens. *Petala* alba (ex *Kerr*), linearia, obtusa, 8·5 mm. longa, pluricostata, dorso pilis brevibus sericeis adpressis sparse instructa, intra nisi inferne breviter crasse pilosa. *Filamenta* 3·25 mm. longa, pilosa, antheris linearibus

2.75 mm. longis. *Stylus* 6.75 mm. longus, superne pilis paucis brevibus instructus.

Kaw Samui, 200 m., evergreen forest, *Kerr* 12561.

***Polyosma oblonga* Craib** [Saxifragaceae-Escallonieae]; a *P. conocarpha* Ridl. et *P. mutabile* Blume drupa ambitu oblonga, endocarpio apice obtuso vel obtuse subacuminato nequaquam acuto recedit.

*Arbor* circa 7 m. alta (ex *Kerr*); ramuli novelli sicco adpresse fulvo-pubescentes, cito glabrescentes, fusco-corticati, lenticellis conspicuis haud numerosis. *Folia* oblongo-oblancheolata, subelliptico-oblonga, rarius late oblanceolata, apice acuminata, primo apiculata, basi cuneata, haud rarius parum inaequilateralia, 7-14.5 cm. longa, 2.5-5.5 cm. lata, chartacea, sicco supra plus minusve fuscescentia, subtus flavo-viridia, supra glabra vel ad costam puberula, subtus ad costam nervosque adpresse pubescentia, aliter pilis sparsis adpressis instructa, matura parum glabrescentia, nervis lateralibus utrinque 10-12 intra marginem anastomosantibus supra plus minusve conspicuis subtus subprominentibus, costa supra impressa subtus prominente, margine integra, hic et illic interdum pauperius ciliata, petiolo 1-2 cm. longo supra anguste canaliculato indumento ei ramulorum simili tecto suffulta. *Infructescentia* terminalis, circa 11 cm. longa, rhachi adpresse vel subadpresse fulvo-pubescente. *Drupa* purpureo-atra (ex *Kerr*), sicco atra, ambitu oblonga, basi truncata vel rotundata, parum gibbosa, apice rotundata, styli basi persistente apiculata, calyce persistente, circa 11 mm. longa et 6 mm. diametro, pedicello 4-6 mm. longo plus minusve adpresse pubescente apice bracteolis tribus persistentibus instructo suffulta, endocarpio ambitu oblongo apice valde obtuso vel obtuse acuminato basi truncato gibboso longitudinaliter 8-sulcato sulcis duobus aliis multo magis conspicuis iugis rotundatis haud acutis.

Nakawn Sritamarat, Sichon, under 50 m., evergreen forest, *Kerr* 15673.

***Kalanchoe longifolia* Geddes** [Crassulaceae]; a *K. Crabii* Hamet inflorescentia multo longiore indumento laxiore tecta, floribus longioribus, carpellis brevioribus recedit.

*Herba* perennis, erecta, caule solitario vel caulibus pluribus simplicibus 20-60 cm. altis basi ad 1.5 cm. diametro apice viridibus puberulis inferne purpurascensibus glabris. *Folia* opposita, simplicia vel rarius trisecta; folia vel foliola inferiora ovato-lanceolata, superiora lanceolata vel lineari-lanceolata, apice obtusa, parum indurata, basi marginibus saepe inflexa, cuneata vel rotundata, supra glabra, subtus primo pilis glanduloso-capitatis puberula, cito glabra, 7.5-14 cm. longa, 3.5-6 cm. lata, pagina utraque viridia, valde crassa, costa lata subtus prominente, nervis lateralibus obscuris circa 4 inferioribus obliquis, margine crassius obtuse denticulata vel serrata, petiolo 2.5-7 cm. longo supra conspicue

canaliculato basi complanato caulem amplectente primo pilis glanduloso-capitatis puberulo cito glabro suffulta. *Inflorescentia* terminalis, usque ad 15 cm. longa; pedicelli 5 mm. longi, virides, pilis brevibus glanduloso-capitatis instructi. *Sepala* 4, viridia, basi inter se brevissime connata, lineari-lanceolata, apice subacuta, 8 mm. longa, 2 mm. lata, pagina utraque et margine pilis brevibus glanduloso-capitatis instructa. *Corollae* tubus 1.3 cm. longus, extra basi viridis, superne pallide viridis, extra pilis brevibus glanduloso-capitatis instructus, intra glaber, inferne 4.5 mm. diametro, apice distincte 4-angulatus, 2 mm. diametro, lobi 4, citrini, oblongo-oblancheolati, apice conspicue acuminati, circa 8 mm. longi, 4 mm. lati, supra glabri, infra pilis brevibus glanduloso-capitatis sparse instructi, margine apicem versus saepe anguste pauci-crenulati. *Stamina* 8, biseriata, 4 inferiora alternipetala, circa 9 mm. supra corollae tubi basem inserta, 4 oppositipetala circa 1 mm. altius inserta, eorum antheris ad os tubi attingentibus, filamentis ad 1 mm. longis glabris, antheris parvis pallide viridibus. *Pistillum* glabrum, 9 mm. altum, carpellis viridibus nitidis, stylis pallidis, stigmatibus parvis, squamis subulatis ad 4 mm. longis.

Lôi, Wang Sapung, 300 m., limestone rocks, *Kerr* 8775. Described from plants raised from seed of above collection which flowered at Aberdeen in February, 1928.

**Combretum annulatum** *Craib* [Combretaceae-Combreteae]; a *C. squamoso* Roxb. eiusque affiniorebus foliis ternatis interdum alternis basi saepissime cordatulis, fructu, alis inclusis, ambitu late elliptico recedit.

*Frutex* volubilis (ex *Kerr*); ramuli cortice pallide brunneo vel cinereo obtecti, lenticellis paucis parvis prominulis sed vix conspicuis. *Folia* ternata vel interdum alterna, saepissime oblongo-elliptica, acuminata, basem versus angustata, ima basi cordatula vel truncata, usque ad 19 cm. longa et 9.5 cm. lata, rigide chartacea vel subcoriaceo-chartacea, sicco viridia vel saepissime plus minusve brunnescentia, matura supra verruculosa, subtus squamosa, squamis parvis nisi ad costam nervosque laterales ubi saepe contiguis inter se sat distantibus, nervis lateralibus utrinque 9 intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis supra plus minusve conspicuis subtus magis conspicuis vel subprominulis, margine integra, recurva, petiolo 6-10 mm. longo supra canaliculato suffulta. *Spicae*. fructiferae axillares, solitariae, ex axillis foliorum alternorum ortae vel ad apices ramulorum ubi folia ternata paniculam foliatam formantes, pedunculo communi circa 3 cm. longo incluso ad 10 cm. longae, et pedunculo et rhachi squamis instructis. *Fructus* alis inclusis late ellipticus, apice subtruncatus, styli basi persistente apiculatus, basi rotundatus vel truncatus, acuminatus, 4 cm. longus, 3.3 cm. latus, ubique squamulosus.

Chumpawn, Ta Ngaw, 100 m., evergreen forest, *Kerr* 11488.

**Combretum quadratum** Craib [Combretaceae-Combreteae]; ramulis quadrangularibus *C. quadrangulari* Kurz et *C. procurso* Craib affine, ab ambobus spicis paniculam foliatam terminalem formantibus recedit.

*Frutex* circa 4 m. altus (ex *Kerr*); ramuli iuventute quadrangulares, densius pallide squamulosi, mox teretes, pallide brunneo-corticati, lenticellis haud conspicuis. *Folia* opposita vel subopposita, oblongo-elliptica, oblongo-ovata, vel suboblonga, apice obtuse acuminata vel subacuminata, basi cuneata, haud rarius rotundata vel acuminata, 5-9 cm. longa, 2.5-4.5 cm. lata, matura rigide chartacea, sicco supra subplumbea, subtus pallide viridia, pagina utraque dense squamulosa, nervis lateralibus utrinque circa 6 supra conspicuis subtus prominulis marginem versus evanidis, nervulis omnino obscuris, petiolo ad 1 cm. longo supra canaliculato primo dense squamuloso suffulta. *Spicae* paniculam terminalem ad 15 cm. longam formantes, pedunculo communi circa 1.5 cm. longo incluso circa 2 cm. longae, pedunculo quadrangulari dense pallide squamuloso, ex axillis bractearum foliacearum lanceolarum oblongo-lanceolarum vel ovato-lanceolarum apice acuminatarum basi cuneatarum vel acuminatarum 1-2 cm. longarum 0.4-1.2 cm. latarum petiolo 5-6 mm. longo suffultarum ortae. *Fructus* primo plus minusve ellipticus, fere maturus rotundatus vel oblato-rotundatus, alis 4 tenuibus inclusis ad 2.5 cm. diametro, squamulosus.

Korat, Kao Lêm, 1300 m., scrub on summit, *Kerr* 9950.

**Eugenia anacardifolia** Craib [Myrtaceae-Myrteae]; ab affini *E. javanica* Lamk. foliis basi latioribus nervis lateralibus magis robustis et praesertim inflorescentia ramosa recedit.

*Arbor* circa 8 m. alta (ex *Kerr*), glabra; ramuli sat crassi, iuventute pallidi, paulo compressi, cito pallide brunneo-corticati, ad nodos parum complanati, aliter teretes, lenticellis haud conspicuis. *Folia* opposita vel subopposita, oblonga, late lanceolato-oblonga, vel oblanceolato-oblonga, apice obtuse acuminata, basi auriculato-cordata, saepe inaequilateralia, ad 25 cm. longa et 7.5 cm. lata, chartaceo-coriacea, saepissime sparse pellucido-punctata, subtus pallidiora, subglauca, nervis lateralibus utrinque circa 14 supra saepe parum impressis subtus prominentibus fere semper rectis, nervis transversis paucis subtus prominulis, costa supra impressa subtus prominente, nervo intramarginali subtus prominente 5-7 mm. intra marginem posito, petiolo 5-10 mm. longo valido primo supra late canaliculato mox subplano suffulta. *Inflorescentia* terminalis, axillaris, vel ex axillis foliorum delapsorum orta, e basi ramosa, ad 4 cm. longa, ramis lateralibus infimis ad 4 cm. longis; pedicelli (infra articulationem) 5 mm. longi vel cymulae floris terminalis haud evoluti; bractae omnes deciduae. *Receptaculum* sub anthesin 1 cm. longum, apice late campanulatum, supra ovarium distincte productum, dimidio inferiore pedicellum sat validum simulans. *Sepala* 4, paulo post anthesin persistentia, ad 7.5 mm. longa, conspicue glanduloso-punctata. *Petala* 4, inter se libera,

circa 1.2 cm. longa, conspicue glanduloso-punctata. *Stamina* ad 1.7 cm. longa, *antheris* circa 0.8 mm. longis.

Langsuan, Kao Nom Sao, 600 m., evergreen forest, flowers pink, *Kerr* 12081.

***Eugenia angkae* Craib** [Myrtaceae-Myrteae]; ab *E. toddalioide* Wight foliis tenuioribus maioribus longius petiolatis distincta.

*Arbor* circa 8 m. alta (ex *Kerr*), glabra; ramuli graciles, primo pallidi, mox cortice pallide brunneo vel rubro-brunneo obtecti. *Folia* opposita, oblonga vel oblongo-elliptica, apice obtuse caudato-acuminata, basi cuneata vel rotundato-cuneata, interdum parum inaequilateralia, 9–13 cm. longa, 4–6 cm. lata, chartacea, pellucido-punctata, costa supra impressa subtus prominente, nervis lateralibus utrinque numerosis inter se parallelis supra plus minusve subconspicuis subtus subprominulis, nervis transversis paucis supra vix conspicuis subtus fere subprominulis, nervo intramarginali vix 1 mm. intra marginem distincte cartilagineam posito, petiolo 6–11 mm. longo supra canaliculato suffulta. *Cymae* axillares. *Fructus* vix maturus subglobosus, ad 1.3 cm. diametro, receptaculi tubo et interdum calycis lobis coronatus.

Doi Angka, 1300 m., dense evergreen forest, *Kerr* 5287.

***Eugenia quadrialata* Craib** [Myrtaceae-Myrteae]; ab affini *E. pseudotetraptera* King cymis axillaribus, floribus haud dense glomerulatis recedit.

*Arbor* circa 7 m. alta (ex *Kerr*), glabra; ramuli straminei, 4-alati, alis iuventute arcte undulatis cito rectis saltem per annos duos saepissime persistentibus circa 1 mm. latis. *Folia* opposita, oblonga vel oblongo-lanceolata, apice longius acuminata, subobtusata, basi rotundata, rarius cuneato-rotundata, 5–10 cm. longa, 2–4 cm. lata, rigide chartacea, sicco viridia, subtus parum pallidiora, subtus ad costam pauci-punctata, costa supra impressa subtus prominente, nervis lateralibus patulis vel oblique patulis utrinque circa 12 aliis tantum paulo minus conspicuis interspersis inter se parallelis et saepissime circa 5 mm. distantibus prope marginem nervum intramarginalem formantibus supra impressis subtus prominentibus, nervulis supra obscuris subtus paucis plus minusve conspicuis, margine integra, parum revoluta, anguste cartilaginea, petiolo 2–3 mm. longo transverse corrugato vel subtus verrucoso-tuberculato suffulta. *Inflorescentia* cymosa, axillaris, pedunculo communi circa 1 cm. longo incluso circa 3 cm. longa, cymis ultimis subsessilibus e floribus tribus pedicellis basi articulatis ad 2 mm. longis suffultis constitutis, pedunculo cum rhachi 4-alato ima basi bracteis lanceolatis subulato-acuminatis 4 mm. longis rigidis persistentibus et paululo superius bracteis latioribus tenuioribus deciduis instructo, bracteis apud cymulas deciduis; flores albi (ex *Kerr*). *Receptaculum* pallidum, irregulariter longitudinaliter corrugatum, parce punctatum, circa 4 mm. longum et 2.5 mm. diametro, supra ovarium distincte productum. *Calycis* segmenta 5, rotundata, 1.5 mm. longa, basi



1.6 mm. lata, irregulariter decidua. *Petala* calyptratis decidua. *Discus* conspicuus. *Stylus* 1 cm. longus. *Ovarium* 2-loculare.

Surat, Klawng Nam Wing, 100 m., evergreen forest, *Kerr* 12238.

***Eugenia referta* Craib** [Myrtaceae-Myrteae]; species inflorescentiis ex axillis annotinis ortis quam foliis multo brevioribus ab *E. toddalioide* Wight nervulis rete gracile quam nervis lateralibus tantum paululo minus conspicuum efficientibus recedens.

*Frutex* vel *arbor* parva (ex *Kerr*); ramuli annotini cinerei vel pallide brunneo-cinerei, primo parum complanati, mox teretes, lenticellis haud conspicuis. *Folia* opposita vel subopposita, saepissime suboblonga, oblongo-elliptica vel elliptica, apice acuminata vel subacuminata, summo apice obtusa, costa parum excurrente primo apiculata, basi cuneata vel rotundata, 5.5–9 cm. longa, 2–4.3 cm. lata, rigide chartacea, glabra, sparse inconspicue punctata, nervis lateralibus utrinque numerosis inter se parallelis supra prominulis subtus paulo magis prominulis pagina utraque quam rete tantum paululo magis prominulis, nervis intramarginalibus duobus altero apud marginem altero magis prominulo 1–1.5 mm. intra marginem, margine anguste cartilaginea, paululo recurva, petiolo 5–9 mm. longo supra canaliculato suffulta. *Cymae* in ramulis annotinis axillares, petiolos vix superantes vel ad 3 cm. longae, glabrae, breviter pedunculatae; bractae squamiformes, deciduae; flores albi (ex *Kerr*), sessiles. *Receptaculum* turbinatum, 3 mm. longum, apice 4 mm. diametro, supra ovarium distincte productum. *Calycis* lobi deltoidei, circa 1 mm. longi, decidui. *Corolla* ut videtur calyptratis decidua. *Stamina* 5 mm. longa, antheris parvis. *Stylus* 6 mm. longus; ovarium 2-loculare.

Kanburi, Wangka, 200 m., among limestone rocks, *Kerr* 10472.

***Eugenia rigens* Craib** [Myrtaceae-Myrteae]; species nova inter species floribus mediocribus et petalis inter se liberis foliis coriaceis nervis paucis conspicuis floribus sessilibus receptaculo turbinato longitudinaliter rugato distincta.

*Arbor* circa 10 m. alta (ex *Kerr*), glabra; ramuli iuventute sicco fusi, parum complanati, mox teretes, sat crassi, cortice cinereo vel brunneo-cinereo obtecti, lenticellis obscuris. *Folia* opposita, saepissime elliptica vel oblongo-elliptica, apice acuminata vel caudato-acuminata, basi cuneata, acuminato-cuneata, vel rotundato-cuneata, interdum inaequilateralia, 6.5–14 cm. longa, 3–7.3 cm. lata, coriacea, epunctata vel pagina utraque punctis paucis rarius notata, nervis lateralibus utrinque circa 8 paucis aliis tantum paululo minus conspicuis additis infimis obliquis supremis plus minusve patulis supra interdum paululo prominulis interdum parum impressis subtus prominentibus, nervis transversis vix conspicuis, nervis intramarginalibus duobus altero paulo intra marginem altero robustiore 3–7 mm. intra marginem, margine recurva, petiolo 5–12 mm. longo supra canaliculato suffulta. *Inflorescentia* cymosa, 4.5 cm. longa, pedunculo communi circa 5 mm. longo suffulta, cymularum

pedunculis 1 cm. longis, et rhachi et pedunculis obtuse angulatis, floribus albis (ex *Kerr*) sessilibus. *Receptaculum* late turbinatum, circa 1 cm. longum et apice 1.2 cm. diametro, inferne saepissime plurisulcatum, supra ovarium conspicue productum. *Calycis* segmenta oblato-rotundata, circa 6 mm. longa et 9 mm. lata. *Petala* inter se libera, oblata, circa 7 mm. longa et 11 mm. lata. *Stamina* 1 cm. longa, antheris paulo ultra 1 mm. longis. *Stylus* 1.5 cm. longus; ovarium 2-loculare.

Langsuan, Kao Nom Sao, 900 m., evergreen forest, *Kerr* 12045.

***Eugenia subrigens* Craib** [Myrtaceae-Myrteae]; ab *E. rigente* Craib foliis tenuioribus floribus minoribus recedit.

*Arbor* circa 15 m. alta (ex *Kerr*), glabra; ramuli graciles vel subgraciles, primo parum complanati, cortice laevi pallide brunneo vel cinereo-brunneo obtecti. *Folia* opposita, elliptico-oblonga, ovato-oblonga, vel subelliptica, apice longius obtuse acuminata, basi cuneata vel acuminata, saepe parum inaequilateralia, 7.5–12 cm. longa, 2.8–5.8 cm. lata, subcoriacea, epunctata, nervis lateralibus utrinque 6–8 paucis aliis paulo minus conspicuis interiectis rectis supra sat conspicuis subtus prominentibus, costa supra impressa subtus prominente, nervis transversis rete supra tantum iuventute subconspicuum subtus prominulum efficientibus, nervis intramarginalibus duobus altero fere ad marginem altero robustiore saepissime 4–5 mm. intra marginem posito, margine recurva, petiolo 8–10 mm. longo supra mox late haud alte canaliculato suffulta. *Inflorescentia* in ramulis annotinis axillaris, cymosa, usque ad 4 cm. longa, e basi ramosa vel breviter pedunculata; flores albi (ex *Kerr*), sessiles. *Receptaculum* turbinatum, praesertim inferne plus minusve sulcatum, 8 mm. longum, apice circa 8 mm. diametro. *Calycis* segmenta decidua, exteriora oblata, apice truncata, vix 3 mm. longa, 4 mm. lata. *Petala* sub anthesin libera, subrotundata, circa 5 mm. diametro. *Stamina* circa 9 mm. longa, disco sat conspicuo inserta. *Ovarium* 2-loculare.

Pattani, Kao Kalakiri, 900 m., evergreen forest, *Kerr* 14961.

***Eugenia subviridis* Craib** [Myrtaceae-Myrteae]; ab *E. tetragona* Wight ramulis iuventute complanatis et angulatis sed haud acute quadrangularibus, petiolis longioribus, pedunculis crassioribus recedit, *E. Hemsleyanae* King etiam parum similis sed nervis lateralibus minus prominentibus et intra marginem minus conspicue anastomosantibus distinguenda.

*Arbor* circa 12 m. alta (ex *Kerr*), glabra; ramuli crassi, primo complanati, angulati, mox teretes, cortice brunneo vel fusco-brunneo obtecti, lenticellis parvis vix numerosis vel conspicuis. *Folia* opposita vel subopposita, ad apicem ramuli unius subternata, oblongo-obovata, oblonga, vel lanceolato-oblonga, basi cuneata, 14–26 cm. longa, 6.5–10 cm. lata, rigide chartacea vel subcoriacea, sicco supra fuscescentia, subtus saepissime brunnescentia, sparse pellucido-punctata, nervis lateralibus utrinque 12–15 paucis aliis

tantum paulo minus conspicuis additis, supra sat conspicuis subtus prominentibus, costa supra impressa subtus prominente, nervis transversis paucis pagina utraque subconspicuis vel superiore fere obscuris, nervo intramarginali supra subconspicuo subtus prominulo 2-3 mm. intra marginem posito, margine recurva, petiolo 2-2.8 cm. longo supra canaliculato suffulta. *Inflorescentia* in ramulis annottinis axillaris, saepissime 4-6 cm. longa et ex ima basi ramosa pedunculos fasciculatos simulans; cymulae ultimae e floribus tribus parvis subviridibus (ex *Kerr*) sessilibus constitutae; alabastra clavata, circa 5 mm. longa. *Calycis* segmenta parva. *Petala* inter se libera, subrotundata, 2.5-2.75 mm. diametro. *Ovarium* 2-loculare.

Doi Sutep, 1550 m., evergreen forest, *Kerr* 3503.

**Eugenia Winitii** *Craib* [Myrtaceae-Myrteae]; ab *E. cuneata* Wall. foliis longioribus, ab *E. khasiana* Duthie et *E. fluviatili* Hemsl. quibus habitu similis ramulis conspicue quadrangulis vel iuventute subalatis recedit.

*Frutex* 5-metralis (ex *Winit*), glaber; ramuli acute 4-angulati vel iuventute subalati, cortice brunneo vel fusco-brunneo obtecti, lenticellis haud conspicuis. *Folia* opposita vel subopposita, lanceolata vel anguste oblongo-lanceolata, apice obtuse acuminata vel subacuminata, basi cuneata, 6-12.5 cm. longa, 1.8-2.3 cm. lata, subcoriacea, glabra, parce punctata, costa supra impressa subtus prominente, nervis lateralibus utrinque numerosis inter se parallelis intra marginem anastomosantibus pagina neutra valde conspicuis, margine integra, recurva, petiolo circa 5 mm. longo supra canaliculato suffulta. *Cymae* paniculatae, et axillares et terminales, pedunculo communi usque ad 1.5 cm. longo incluso 5-8 cm. longae, glabrae, pedunculo cum rhachi et ramulis stramineo conspicue angulato vel subalato, cymis ultimis trifloris, floribus sessilibus; bractaeae deciduae, circa 1 mm. longae; alabastra 4 mm. longa. *Receptaculum* 3 mm. longum, apice vix 4 mm. diametro, supra ovarium distincte productum. *Calyx* undulatus, lobis vix evolutis. *Petala* calyptratim decidua. *Stamina* ad 4 mm. longa, filamentis apice angustatis, antheris parvis glandula minuta apice notatis. *Ovarium* 2-loculare.

Nan, Mè Sanian, 400 m., rocky bed of stream, *Winit* 1787.

**Barringtonia bicolor** *Craib* [Lecythidaceae]; a *B. Schmidtii* Craib foliis maioribus subtus breviter crispatis pubescentibus vel saltem conspicue puberulis, receptaculi indumento pallido haud ferrugineo inter alia recedit.

*Arbor* 10-15 m. alta (ex *Kerr*); ramuli iuventute brunneo-rubri, densius breviter pubescentes, cito puberuli, annotini cortice brunneo vel cinereo-brunneo obtecti, lenticellis haud numerosis longitudinaliter elongatis. *Folia* apices versus ramulorum aggregata, saepissime oblongo-obovata vel obovata, apice breviter obtuse acuminata vel valde obtusa, vel obovato-oblancoolata, apice acute acuminata, basi longius acuminato-cuneata vel cuneata, 8-19 cm. longa,

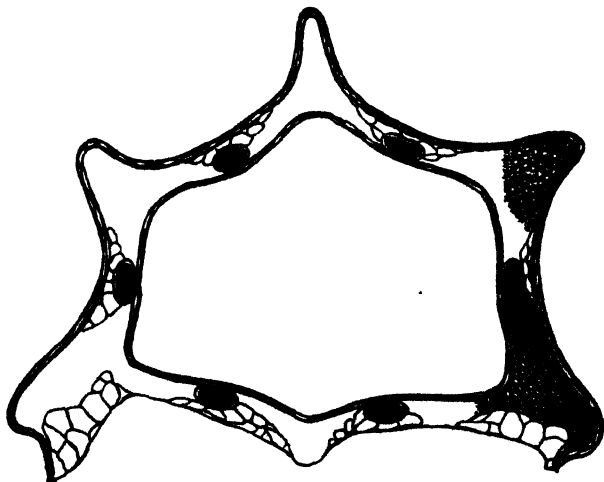
3.5-9 cm. lata, sicco viridia, subtus pallidiora, rigide chartacea, pagina superiore glabra, inferiore ad costam nervosque laterales densius breviter pubescentia, aliter sparsius breviter pubescentia vel puberula, nervis lateralibus utrinque circa 14 supra conspicuis subtus prominentibus rectis vel subrectis intra marginem anastomosantibus, nervulis rete conspicuum formantibus, margine nisi inferne serrulata, petiolo 1-1.5 cm. longo dense puberulo supra late canaliculato suffulta. *Spicae* terminales, ramulos hornotinos terminantes vel rarius etiam paucae axillares, ad 25 cm. longae, pedunculo communi circa 1 cm. longo basi bracteis parvis dense tecto cum rhachi dense griseo-puberulo suffultae; bractee lineari-lanceolatae, acutae, circa 3 mm. longae, pallide virides; alabastra sessilia, circa 4 mm. longa, dense griseo-puberula. *Receptaculum* calyce paulo brevius. *Calycis* segmenta rotundata, ciliata. *Corolla* ante anthesin viridis. *Fructus* ambitu oblongus, parum obtuse angulatus, ad 2.5 cm. longus et 1.2 cm. latus, glaber vel parum puberulus, calyce persistente coronatus, 1-2-locularis.

Nakawn Tai, 200 m. mixed deciduous forest, *Kerr* 5874. Nakawn Sawan, Klawng Kung, 200 m., mixed deciduous forest, *Kerr* 5874A.

## XXII.—LILAEOPSIS IN TASMANIA AND NEW ZEALAND. A. W. HILL.

**Lilaeopsis Gunnii** A. W. Hill, sp. nov.; species foliis subulatis fructibus magnis conspicue costatis distincta.

*Herba* caespitosa; rhizoma repens. *Folia* 4-5 cm. longa, lineari-lanceolata, subulata. *Umbella* 6-8-flora, pedunculi breves, pedicelli 1.5-2 cm. longi. *Fructus* ellipticus vel ovoideus, 3 mm.



*Lilaeopsis Gunnii* A. W. Hill.  
Transverse section of fruit.  $\times 60$ .

longus, 1.75 mm. latus, costis 10, distinctis acutis in sectione transversali omnibus conspicue lignosis prominentibus, vittae 6, quarum 2 commissurales.

TASMANIA. Formosa, in marshy spots (2.12.1848), *Gunn in Herb. N.S. Wales (Sydney)*: Lake Elizabeth, by Great Lake, 3300 ft., *L. S. Gibbs* 6782.

Mr. Clive Lord of the Dominion Museum, Hobart, informs me that 'Formosa' is the name of an estate about 4 miles south of Cressy. It is under the Western Tiers and bounded in part by the Lake River. Cressy is in the Northern Midlands, north-west of Ross.

Gunn's specimens collected in the year 1848 have thin, subulate 'leaves' running to points, which is unusual in the Australian specimens.

Gunn has a note that the plant "buries the fruit in mud in growing as indicated in the specimens."

The plants form small tufts, and the long peduncles are bent over and bring the elongated, sharply-ribbed fruits into contact with the mud in which the plants are growing.

L. Rodway in his "Tasmanian Flora" (1903), pp. 66, 67, mentions several localities in Tasmania for '*Crantzia lineata*,' but unfortunately he does not quote the collectors; apparently he did not know of these specimens collected by Gunn in 1848.

Gunn also collected specimens on December 23rd, 1844, at St. Patrick's River, Launceston, on December 24th, 1844, at a marsh, Launceston, and again in 1845 on January 17th at Arthur's Lakes, and on December 18th, 1845, at Penguinite, but all under the number 2008.

One of these, apparently that collected at Arthur's Lakes, bears fruit, and the fruits are those of *Lilaeopsis Brownii*; these are the only specimens of Gunn's collecting at Kew.

Reference to these specimens was made in the Journ. Linn. Soc., xlvii, p. 546, under *L. Brownii*, and two other specimens collected by L. S. Gibbs were also, in the absence of fruits, doubtfully referred to this species.

One of these, from Lake Elizabeth, by Great Lake, from the subulate character of the 'leaves' (*No. 6782 in Herb. Kew*), should possibly be referred to this new species.

With reference to the genus *Lilaeopsis* in New Zealand it may be useful to put on record the following determinations of specimens from the Dominion Museum Herbarium, collected by Mr. D. Petrie, which were sent to Kew for examination by Mr. W. R. B. Oliver, Director of the Dominion Museum, Wellington.

(1) *L. orbicularis* A. W. Hill (*K.B.* 1928, p. 266).

Two specimens, one from Manganui Bluff, the other from North of Kaihu, Auckland Peninsula, by sea beach.

(2) *L. lacustris* A. W. Hill. Five specimens.

1. Karekare, Waitakerei, West Auckland. 2. Thames, muddy coastal flats. 3. Macrae's Waihemo County, 1800 ft. 4. Hobson Bay, Auckland. 5. Hot streams near Terraces Hotel, Lake Taupo.

The determinations of Nos. 2-5 are not absolute, owing to the absence of fruits.

(3) *L. novae-zelandiae* (Gandog.) A. W. Hill. Six specimens.

1. Cape Foulwind, S.W. Nelson. 2. Near Waikouaiti, E. Coast Otago. 3. Waitahuna near Lawrence, Otago. 4. Bluff, Southland, by beach. 5. N. Heads, Otago Harbour. 6. Petie Bay, Chatham Is.

Nos. 3-5 were without fruits, but appear to belong to this species. The last specimen, from Chatham Island, was collected by Mr. Oliver.

### XXIII.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATORUM. DECAS CXXIII.

1221. *Viola fruticosa* W. Bckr. [Violaceae § *Leptidium* Ging. emend. Bckr.] ; a *V. stipulari* Sw. foliis anguste lanceolatis, brevissime petiolatis, subsessilibus, aequaliter plane crenatis (utrinque 5-10 crenis), haud acuminatis valde differt. Species distinctissima.

*Frutex* humilis, circiter 20-25 cm. altus. *Radix* lignosa, ramosa, haud crassa. *Stirps* lignosa, rotunda, ramosa, ramis foliaceis et floriferis plus minusve elongatis. *Folia* glaberrima, crassiuscula, anguste lanceolata, subsessilia, brevissime petiolata, haud acuminata, aequaliter plane serrata, 1.5-3 cm. longa et 4-7 mm. lata, subdense disposita. *Stipulae* fuscae, anguste lanceolatae, longifimbriatae, internodia haud 1 cm. longa fere aequantes, vel potius breviores, 5-7 mm. longae. *Flores* ad ramorum fines dispositi, parvi, 5-6 mm. longi ; pedicelli tenues, basi bracteolati, folia superantes. *Sepala* angustissime subulata, brevissime appendiculata ; corolla ceterum notis sect. *Leptidium*, brevissime calcarata. *Capsula* ellipsoidea ; semina ovoidea, laevia.

SOUTH AMERICA. Without exact locality, herb. *Lehmann* No. Kew 22. Probably from the Andes of Venezuela or Colombia.

1222. *Geranium azorelloides* *Sandwith* [Geraniaceae-Geranieae] ; affinis sect. *Andina* R. Knuth, *G. cucullato* H.B.K., foliis ambitu oblongis vel obovato-oblongis, vix ad medium simpliciter trilobatis tantum, crasse coriaceis subnitentibus, margine apice setifero excepto ciliatis, petiolis brevioribus primo visu distinguitur.

*Planta* perennis humillima. *Caudex* inferne nudus circiter 1 mm. diametro, sursum stipulis castaneis petiolisque dense obtectus igitur 3-7 mm. diametro, simplex vel nonnunquam ramosus, apice caespitem foliorum florumque 2-3 cm. diametro formans. *Stipulae* castaneae scariosae glabrae 8-10 mm. longae, petiolo inferne fere ad tertiam partem adnatae, parte libera anguste lanceolatae atque longe acuminato-aristatae. *Folia* petiolo superne dense adpresse retrorso-piloso 6-7 mm. longo ; lamina ambitu oblonga vel obovato-

oblonga, 6–9 mm. longa, apice 2–5 mm. lata, basi subrotundata, apice ultra  $\frac{1}{2}$  sed vix ad medium profunde simpliciter trilobata, lobo medio laterales superante, lobis omnibus anguste triangulari-lanceolatis obtusis sed setis albis 1–2 conspicuis 0.5–1 mm. longis terminatis, crassa coriacea subnitens, setis exceptis glaberrima, supra nervis 3–5 (plerumque 3) palmatis conspicuis. *Flores* petalis exceptis folia aequantes neque superantes; pedunculi solitarii uniflori, pilis albis retrorsis adpressis obtecti, circiter 7 mm. longi. *Sepala* oblongo-lanceolata, 7–8 mm. longa, fere ad apicem margine rubro-fusco scarioso pilis antrorsis ciliata, apice ipso incrassato rostriformi immarginato inferne intus fasciculo pilorum minimorum praedito atque setis 1–2 eis foliorum similibus terminato. *Petala* obovata unguiculata, apice emarginata, calyce duplo longiora igitur circiter 1.4 cm. longa, lamina 3–4 mm. lata, verisimiliter rosea, nervis 5–7 intensius coloratis notata. *Fructus* rostro pilosulo calycem aequante vel superante.

COLOMBIA. Cauca; Páramo de Guanacas, prov. Popayan, 3200 m., November 1882, *Lehmann* 2139.

Lehmann did not, apparently, collect more than enough for a single set of this extremely distinct little plant.

1223. **Chisocheton rigidus** *Ridl.* [Meliaceae]; affinis nulli specie arcte, foliis alternis coriaceis, panícula brevi floribus eos *Dysoxylis* simulantibus, sed disco quam ovario breviorē hirtō.

*Arbor*, foliis glabris, ultra 45 cm. longis, foliolis 5 dissitis alternis coriaceis politis obovatis acutis basibus cuneatis inaequilateris nervis prominentibus subtus 8-paribus inarcuantibus nervulis conspicuis subparallelis copiosis, 15–20 cm. longis 8.5–9 cm. latis petioulis incrassatis 1 cm. longis, paniculis lateralibus 8 cm. longis pubescentibus, bracteis ovatis acutis pubescentibus, calyce 3–4 lobo lobis ovatis acutis pubescentibus 4 mm. longis, petalis 5 oblongis obtusis pubescentibus 5 mm. longis, staminum tubo cylindrico petalis vix longiore, vix dentato extra pubescente, antheris oblongo-linearibus 10, disco breviter tubuloso hirtō, ovario conico longiore, stylo validulo, stigmate pulviniformi glabro, capsula (immatura) subglobosa 2.5 cm. lata.

MALAY PENINSULA. Pahang, Temerloh, Kemansul Reserve, *Forest Ranger Hamid* 10880. Native name "Kulim Gajah." Johor, Castlewood, *Ridley* 12492. Selangor, Welds Hill, Kuala Lumpur, *A. Rahman* 2829.

The flowers are short like those of a *Dysoxylon* and in short stout panicles much shorter than the leaves, the leaflets are few, coriaceous and alternate, the disc is shorter than the ovary and hairy.

1224. **Schoepfia velutina** *Sandwith* [Olacaceae-Olaceae]; indumento brevi denso ramulorum et praesertim foliorum subtus mollium tactu velutinorum distinctissima.

*Frutex* 1.2 m. altus; ramuli teretes, tenuissime striati, 30 cm. infra apicem 3–4 mm. diametro, passim (etiam senectute) breviter

dense pilosuli vel tomentelli; internodia 2-4 cm. longa. *Folia* alterna, anguste lanceolata ad ovato-lanceolata, apice longe acute acuminata, basi etiam attenuata cuneata, 8-11.5 cm. longa, 2-4 cm. lata, integerrima, chartacea, supra olivacea sed senectute nigrescentia, subnitida, tenuiter reticulata, ceterum venatione ut in aliis speciebus, costa dense molliter tomentella, ceterum glabrescentia sed sparse minute pilosula, subtus passim molliter griseo-velutina tomentella; petiolus brevissimus 1-3 mm. longus, indumento ei costae simili praeditus. *Racemi* axillares plerumque 2-4 fasciculati brevissimi ad 1.5 cm. longi; pedunculus pedicellique minuti indumento ramulorum foliorumque induti. *Flores* subsessiles in quoque racemo vulgo 4-8, trimeri tetrameri vel rarius pentameri. *Calyx* acute triangulariter 3-5-lobatus, extra indumento eodem ramulorum praeditus. *Discus* hypogynus turbinatus glaberrimus, margine undulato-sinuato, 1 mm. altus, ad 1.5 mm. diametro. *Corolla* ericaceo-campanulata vel urceolata, cum lobis 4-5 mm. longa, basi 3 mm. lata, extra glaberrima atque siccitate fusco-rubra, intus glabra fasciculo pilorum pone antheram quamque excepto; lobi 3-5 triangulares, maturitate patulo-recurvati, ad 1.5 mm. longi, basi ad 2 mm. lati, intus margine obscure puberulo atque siccitate grisei. *Stamina* 3-5 fauce corollae sub lobis inserta; antherae fere sessiles; filamenta cum parte libera brevissima ad 0.2 mm. tantum longa. *Ovarium* rugulosum, prope apicem umbilicatum obscure minute puberulum, fere ad 1 mm. altum, ad 1.5 mm. diametro; stylus glaber, cum stigmate capitato 1.5-3 mm. longus. *Fructus* drupaceus glaber nigrescens, obovoideus, ad 1.3 cm. longus, circiter 7 mm. diametro, annulo disci apicali ad 3 mm. diametro.

BRAZIL. Matto Grosso: near the source of the Rio Paraguay (Rio Amolar), Diamantino, on rocky soil in forest at 2000 ft., May 1927, Miss Gwen Dorrien Smith 200. "Shrub 4 feet high; flowers green."

1225. ***Pseudoeugenia tenuifolia* Ridl.** [Myrtaceae]; affinis *P. perakiana* Scort., foliis multo tenuioribus nervis paucioribus distincte differt.

*Arbor* ramulis albis, *foliis* membranaceis lanceolatis longicaudatis basi acuminatis, nervis ad 20-paribus in margine inarquantibus 11 cm. longis 3 cm. latis, petiolis 1 cm. longis gracilibus, *floribus* minutis axillaribus paucis pedicellis 2 mm. longis, *sepalis* 4 ovatis, *petalis* vix longioribus rotundatis, *staminibus* 8 ad 10, filamentis brevibus sepalis non superantibus, antheris subglobosis.

MALAY PENINSULA. Pahang, Temerloh Kemansul Reserve, *Forest Ranger Hamid* 10556. Native name "Serai Kayu."

This is unlike any species known to me in its thin membranous leaves and few nerves. *P. perakiana* Scort. (*Eugenia skiophila* Duthie) has rather larger stiffer leaves with very numerous close-set parallel inconspicuous nerves.



1226. **Hederopsis major** Ridl. [Araliaceae]; affinis *H. Maingayi* C. B. Cl., foliis crassioribus oblongo-ovatis, panícula majore, floribus multo majoribus, petalis triangulari-lanceolatis differt.

*Arbor* glabra, *foliis* subcoriaceis trifoliolatis, foliolis oblongo-ovatis obtuse acuminatis basibus obscure inaequilateris, nervis 4-paribus, 5.5–10 cm. longis 2–5 cm. latis petiolulis lateralibus 5 mm., terminali 2 cm. longis, petiolis 5–10 cm. longis, *paniculis* terminalibus patentibus 20 cm. longis, ramis dissitis 5 cm. longis, umbellis 8 floris pedicellis 8 mm. longis furfuraceis, *floribus* 9 mm. latis pedicellis articulatis, *sepalis* brevibus acuminatis, *petalis* 5 valvatis crassis triangulari-lanceolatis acutis, *staminibus* 5 filamentis gracilibus, antheris subglobosis dorsifixis, *stylo* breviter conico apice 2–3 dentato, *ovario* 5-loculari, obconico obscure costato, fructibus non-visis.

MALAY PENINSULA. Kelantan, Kwala Aring, Sept. 14, 1899, *R. H. Yapp* 205.

The genus *Hederopsis* is based on a single species once collected by Maingay and never re-collected, which differs from this species in the larger, thinner, lanceolate dentate leaflets, smaller panicle and much smaller flowers, broader sepals and more elongate style.

1227. **Casselia rosularis** Sandwith [Verbenaceae-Verbeneae]; habitu nano rosulari ab omnibus speciebus differt.

*Herba* parva, radice inferne insigniter tuberosa, caule subterraneo supra tubere ad 2 cm. longo pilosulo, floribus foliisque in rosula terrae adpressa 3–6 cm. diametro dispositis. *Folia* exteriora plerumque 4, orbicularia, late oblonga, vel late obovata, apice rotundata obtusissima, basi attenuata vel rotundata, vulgo 1.5–2.5 cm. longa, 1–2.5 cm. lata, interiora minora, omnia supra nigricantia glabra scabriuscula profunde rugosa, subtus purpurascens rugosa nervis fortiter exstantibus pubescentibus ceterum glabra, margine praesertim dimidio superiore leviter satis inconspicue crenato-dentata; petiolus brevis, pilosulus, ad 4 mm. longus vel subnullus. *Flores* complures in racemis axillaribus, siccitate pseudoterminalibus, dispositi; pedunculi, pedicelli breves 1–1.5 mm. longi, calycesque in angulis atque dentibus pilis brevibus albis setaceis induti; bracteae setaceae ad 1.5 mm. longae. *Calyx* tubo 4–5 mm. longo, fructifero ampliato, angulis crassis pilosulis exceptis glabrescente, sed passim minutissime pubescente, dentibus triangularibus inaequalibus 0.6–1.6 mm. longis. *Corolla* tubo inferne angusto glabro superne ampliato utrinque pubescente ad 7 mm. longo; limbus ad 1 cm. diametro, lobis late rotundatis 2–3 mm. longis ad 5 mm. latis, utrinque pubescentibus. *Stamina* postica 3.5 mm., antica 2.8 mm. supra fundo tubi inserta, filamentis brevibus pubescentibus. *Ovarium* glabrum, ellipsoideum, circiter 1 mm. altum atque 0.7 mm. diametro; stylus glaber, cum stigmate obliquo 1.5–1.8 mm. longus. *Fructus* (immaturus tantum) carnosus rugulosus flavo-olivaceus, fere 3 mm. altus, 2.5 mm. diametro, stylo persistente.

BRAZIL. Matto Grosso : Burity, on the Chapada plateau N.E. of Cuyabá, 2250 ft., in firm sand in grass in scrub country, September 1927, C. L. Colletette 185. "Forms a rosette on the surface of the ground. Flowers mauve."

1228. **Santalum papuanum** *Summerhayes* [Santalaceae]; affinis *S. lanceolato* R. Br. a quo foliis subchartaceis discoloribus, floribus minoribus, perianthii lobis subacutis, stylo fere exserto differt.

*Arbor* gracilis, multiramosa; caulis cortice rugoso brunneo obtectus; ramuli teretes, grisei, longitudinaliter striati. *Folia* petiolata, late elliptico-lanceolata, apice subacuta, basi cuneata, 5-8 cm. longa, 2-2.75 cm. lata, marginibus leviter revolutis integris leviter undulatis, utrinque glabra, costa supra prominula subtus prominente, nervis lateralibus utrinsecus 9-14 prope marginem arcuatim conjunctus supra prominulis, nervis secundariis reticulum distinctum formantibus; petiolus gracilis, 7-10 mm. longus, supra leviter complanatus, canaliculatus. *Paniculae* in axillis foliorum superiorum, breves, 1.5-2.5 mm. longae; bractae minutae, cito deciduae. *Flores* 4-4.5 mm. longi; perianthii tubus campanulatus, 2 mm. longus, glaber; lobi 4, ovati, subacuti vel fere apiculati, 2-2.5 mm. longi, 1.5 mm. lati; filamenta 1.5 mm. longa; antherae 1 mm. longae; disci lobi oblongi, 1 mm. longi; stylus fere exsertus, stigmatibus trilobis coronatus. *Fructus* non visus.

PAPUA. Rigo, a coast timber, cut for export, Dec. 1925, J. L. Brass 819.

1229. **Cephalostemon microglochin** *Sandwith* [Rapateaceae]; a ceteris speciebus capitulis paucifloris, bracteis caerulescentibus omnibus brevissime mucronulatis vel aristatis, floribus parvis differt; quoad bracteas extimas *C. gracili* Rob. Schomb. similis.

*Habitus* generis. *Folia* flavo-viridia subrigida sed siccitate arcuato-curvata, basi ad 8 cm. late vaginata, usque ad 45 cm. longa, obtusa, angusta, versus apicem vaginamque angustata, medio 2.5-4 mm. lata, nervis 6-8 atque costa subtus valde prominentibus. *Pedunculi* 5-costato-angulati, ad 50 cm. longi, diametro 1 mm. haud multo excedentes. *Spatha* bivalvis, valvis flavo-viridibus basi late auriculatis 2-3 cm. longis, horizontalibus vel adscendentibus. *Capitula* ad 1.5 cm. alta, ad 2 cm. diametro; flores 3 sessiles; bractae imbricatae, parte superiore haud operta caerulescenti-viridi, striatae, marginibus hyalinis, extimae concavae spathulatae 5 mm. longae ad 2.2 mm. latae brevissime mucronulatae, intimae lanceolatae 7-8 mm. longae ad 2 mm. latae in aristam brevissimam 0.5-1.5 mm. longam attenuatae. *Sepala* 3 straminea, basi connata, concava, ovato-lanceolata, 6-7 mm. longa, basi applanata ad 4 mm. lata. *Petala* membranacea, tenerrima, 7 mm. longa, lobis rotundatis 6 mm. latis. *Stamina* 6 brunnea, filamentis 1 mm. longis, antheris 3 mm. longis, igitur petalis sepalisque facile breviora. *Ovarium* album, trigonum, circiter 1.2 mm. altum atque diametro; stylus 3.5 mm. longus.

BRAZIL. Matto Grosso : near the source of the Rio Paraguay (Rio Amolar), Diamantino, in moist boggy soil on the edge of fringing forest, May 23rd, 1927, *Miss Gwen Dorrien Smith* 151. "Flowers pale yellow."

1230. *Pothos armatus* C. E. C. Fischer [Araceae]; proximus *P. remotifloro* Hook., differt ramulis spinulosis, petiolis brevibus et sine alis, spathis brevioribus, inflorescentiis puberulis, florum glomerulis dispersis.

*Frutex* scandens, omnibus partibus glaberrima praeter spadices; rami ramulique graciles, parum angulati vel striati, pallide brunnei, internodiis distinctis, ramorum 1.5-3.5 cm. longis ramulorum 2-10 mm. longis, nodis parum incrassatis, ob radículas spiniformes solitarias vel complures, 1-2.5 mm. longas armatis. *Folia* lineari- vel elliptico-lanceolata, parum inequilateralia, acuta vel acuminata vel caudata, basin versus angustata, 8-14 cm. longa, 2-3.6 cm. lata, nervis supra distinctis, costa et nervis lateralibus primariis infra prominentibus, nervis rectis ita e costa divaricatis ut angulum dimidium anguli recti subaequantem exhibeant, marginibus aliquantum revolutis, nervo crasso margine parallelo; petioli 7-12 mm. longi, supra parum canaliculati, basi semiamplexicaules, saepe torti. *Pedunculi* teretes, graciles, 3-7.5 cm. longi, plerumque arcuati, fusco-brunnei siccitate, 1-2-ni, in ramulis brevibus extra-axillaribus; bracteae, pedunculos amplectentes 4-6 fusco-brunneae, inferiores suborbiculari-ovatae minutae superiores lineari-oblongae obtusae, 1.5 cm. longae. *Spathae* anguste cymbiformes obtusae vel acutae, 1.4-2 cm. longae, fusco-brunneae. *Spadix* gracilis, teres, vel recta vel anfractuosa, pilis furfuraceis fuscis puberula, 3.75-5.75 cm. longa; stipes 0.5-0.8 cm. longus saepe glaber. *Flores* pilis furfuraceis fuscis puberuli, minuti, glomerati, glomerulis spiraliter positis ad angulas spadicis millimetro interposito. *Segmenta perianthii* suborbicularia. *Stamina* perianthio longiora; antherae minutae, albae. *Ovarium* oblongo-truncatum. *Bacca* oblonga, 5 mm. longa, glabra, nisi in apice truncato fusco-puberulo.

SOUTH INDIA. Tambracheri Ghat, Malabar, Jan., C. A. Barber 5698 (type, in Herb. Kew.); Ghat from Ponmudi to Kullar, Travancore, Dec., C. A. Barber 7431.

#### XXIV.—HYBRID CACAO. F. N. HOWES.

In recent years several workers in cacao-growing countries have produced evidence indicating the undoubted hybrid nature of cultivated cacao. In two interesting articles by M. Pittier ("Revue de Botanique Appliquée," Dec. 1925 and June 1926), who has made a study of cacao in Venezuela for many years, an account is given of the different cultivated forms of cacao in Venezuela and of the other wild or indigenous species of *Theobroma* in that country. M. Pittier regards all forms of cultivated cacao as belonging to, or

constituting intermediate or hybrid forms between, two fundamental species, *Theobroma Cacao* L. and *T. leiocarpa* Bern. These two fundamental species are regarded as constituting the two extremes of a very wide range, most cultivated forms falling in an intermediate position rather than corresponding with the two extremes. To *T. Cacao* L. would belong the more typical "criollo" cacao of commerce, the pod being rather elongated, clavate, with a rough surface and ten longitudinal furrows, five deep alternating with five shallow. The seeds are plump with pale cotyledons. *T. leiocarpa* Bern., on the other hand, embraces the type characterised among other things by a large, oval, smooth pod with five slightly evident furrows, and flat seeds with dark cotyledons. In Ceylon, the East Indies, and other eastern countries, the cacao grown approaches for the most part *T. Cacao* L., whereas in San Thomé and the large areas under cultivation in West Africa, the forms approach more closely *T. leiocarpa* Bern., the extreme form even appearing in some instances.

The fact that natural crossing takes place readily in cacao, to an extent of about 30 per cent. in Trinidad, has been proved beyond doubt (Genetica, ix, 1927, pp. 280-8). The presence of pollen on the stigmas of flowers of the so-called "male" cacao trees, these flowers producing no pollen themselves, is in itself an indication of the presence of cross-pollination under normal conditions. Attention has frequently been drawn to the existence in cacao plantations of individual trees, the pods of which contain some seeds with pale cotyledons ("criollo") and some with dark purple cotyledons ("forastero").

Numerous instances of the wide degree of segregation that takes place on raising trees from seed from a single mother tree are on record—in some instances the seed being from a single pod. This may be due to a heterozygous make-up in cultivated cacao or to cross-pollination, or to both these factors. It seems evident that both factors are responsible, their respective influences varying with different conditions and in different strains or types of cacao. An interesting example is afforded from planting experiments carried out by the late Mr. H. L. Van Buuren at Peradeniya, Ceylon, in 1908 (see "The Tropical Agriculturist," Dec. 1928). Five acres were planted from seed of a single high-yielding tree of the "cundeamur" type. When the trees came into bearing a careful study was made of the whole plot and great variation in the size, shape, colour and general nature of the pods was found to exist. Pods of surprising and unexpected forms were met with and it is stated that in this five-acre plot fruits could be selected "showing characters comparable with that of any well-known 'variety' found in the cacao-growing countries of the world." As there is no information to the contrary it is assumed that with the parent tree of this plot no measures were taken to ensure self-pollination. There is also nothing said as to the situation of the parent tree, whether in close proximity to trees of other varieties of cacao or not.

In Trinidad work of a systematic nature on budding of cacao was commenced in 1914, when experiments at the River Estate were arranged by the Department of Agriculture to test to what extent the heavy yielding character of parent trees was transmitted to their offspring in the form of seedlings, grafted and budded plants. In discussing the results of these experiments that have so far been obtained Harland states (*see* "The Yield of Budded and Seeded Cacao," in Proceedings of the Agric. Soc. of Trinidad and Tobago xxviii, Pt. vi, June 1928) "A heavy bearing tree may transmit heavy yield to its budded offspring. On the other hand it may absolutely fail to transmit and may give rise to trees which are much worse than the average. There is no method of telling whether a tree will transmit heavy yield either to its budded or seedling offspring except by testing it."

The fact that cacao cannot, at the present time, be reliably propagated true to type, particularly where yield is concerned, either from budded or seedling trees, illustrates all the more forcibly the urgent need for fundamental cacao research in order that our knowledge and understanding of this important crop should not lag behind in the march of progress that is now being made with many other tropical crops.

Reasons why Trinidad, with the Imperial College of Tropical Agriculture as the centre, should be chosen for cacao research of this nature are clearly outlined by Prof. E. E. Cheesman (Professor of Botany at the College), in a memorandum on "Biological Researches on Cacao" submitted to the Advisory Committee of the College in 1928. Prof. Cheesman draws attention to the great range of variation in the yield of individual trees in the average cacao plantation, where the number of pods produced per tree per annum may vary from less than 10 to over 200. Individual trees he regards as *genetically* heavy, medium or poor bearers, for it has been shown that alterations in treatment do not fundamentally affect these differences in yield.

In view of the length of time that must elapse before one can hope to obtain strains of cacao that will "breed true," Prof. Cheesman lays great emphasis on the urgent need of a thorough investigation into the question of the vegetative propagation of this crop, as the inter-relationship of stock and scion in the case of cacao is at present quite unknown.

Another problem regarded as of first importance is "to determine the factors influencing flavour and whether they are hereditary or environmental." With regard to pruning the author states "A fourth line of investigation, also physiological, concerns pruning—the precise effects of different treatments upon the tree and determination of the best methods. Pruning again is only one method of modifying nutrition, and the other common method, manuring, also stands in urgent need of precise research." At the end of the

memorandum a scheme is suggested for inaugurating the preliminary work, which it is considered could be performed by a geneticist and a physiologist working in close co-operation.

## XXV.—THE IRIDACEAE OF BURMANN'S FLORAE CAPENSIS PRODROMUS. N. E. BROWN.

Through the courtesy of Dr. John Briquet, Director of the Botanic Gardens, Geneva, I have had the opportunity of comparing the types of the South African Iridaceae described by N. L. Burmann in 1768 in his *Florae Capensis Prodrömus* with specimens in the Kew Herbarium. The present paper embodies the result of my comparisons, which, as will be noted, involve several alterations of nomenclature.

The collection is an interesting one: the specimens are mostly very good and well preserved. Many of them are from cultivated plants, and some, I find, are the actual specimens from which the figures in Houttuyn, *Handleiding Plant- en Kruidkunde*, vol. xii, were drawn. These figures, on account of their worthless colouration, have by many been considered to be poor or bad figures; but so far as these specimens show, in outline and size they are exceedingly accurate, so that a photograph would scarcely give the outline more exactly. The names, however, under which they are figured, require to be investigated before accepting them as authentic. Several of the specimens in Burmann's Herbarium I have failed to match with any at Kew, and they are probably undescribed species. Unfortunately not one of them is localised.

Beside the plants of Burmann, the Geneva herbarium contains specimens from many other of the older botanists and collectors, and, as it is sometimes useful to know where the plants of certain collectors may be found, I give below a list of collectors I have noted as being represented among the South African Iridaceae in the Geneva herbarium:—

Belanger, Bergius, Bowie, Chelsea (Hort.), Commerson, Dalhousie (Lady), Drège 1839-1841, Ecklon and Ecklon & Zeyher (1845), Elliot (Miss Eliza) 1838, Elliot ("Miss and Mistress"), Forster, G., Goudot, Graham (Herb.) received in 1846, Leibold 1838, MacWilliam, Masson, Niven, Palisot de Beauvois, Perrottet (Jardin des Plantes 1822-1823), Puerari (Herb.) 1824, Roth, Roxburgh, Salisbury (several of his types), Sieber 1825, Thunberg, Ventenat (Herb.), Verreaux 1827-1828, Wallich, Zeyher.

In Burmann's herbarium are numerous duplicate sheets from Thunberg's herbarium, evidently given to Burmann before Thunberg had published his descriptions, because several of them bear names that do not occur in Thunberg's own herbarium. For example, there are two sheets of *Ferraria undulata* Linn., duplicates from Thunberg's herbarium, both labelled in Thunberg's own handwriting "*Moraea fastuosa* Thunb.", and one of them also bears the name

"*Moraea crispa* Thunb.", but "*crispa*" has been crossed out and "*fastuosa*" substituted. In Thunberg's herbarium the corresponding specimen is named "*Moraea undulata*." The sheet of *Galaxia ovata* Thunb. in Burmann's herbarium is labelled by Thunberg "*Ixia monadelphæ* Thunb."! These two examples suffice to show that Thunberg originally gave other names to some of his species, but that, Linné having altered them, he adopted the names that Linné published or changed them himself.

The collection of Jules Verreaux is probably a complete one, as it contains his original labels, and, as it has not hitherto been known where he collected, I have noted the following localities from his labels:—Table Mountain, 1827-1828; Lion Mountain, June and Sept., 1827; Constantia, Sept., 1827; Slang Kop, Sept., 1827; Mosterts Bay, no date; Hottentots Holland, Sept. and Oct., 1827; Caledon, Oct. and Dec., 1827; Genadendal, Feb., March, Sept. and Oct., 1827; Swellendam, Sept. and Nov., 1827; George, Aug., 1827; Montagu and Uitenhage, no date.

Upon a sheet containing a species of *Babiana* from Roxburgh's herbarium, is written in the handwriting of Salisbury, who was a very clever cultivator of bulbous plants, "At Chapel [Allerton] collection for 10 years, but it never flowered, and I have no doubt owing to pulling of the old coverings off the root every year." This is undoubtedly a very wise remark that is worthy of the attention of cultivators.

One point that this herbarium strongly demonstrates, is the truth of the view that the concept of a species as adopted by Burmann and many of the old botanists, was of such a broad character that even plants belonging to what are now recognised as different genera were included in it and therefore appear under the same specific name.

In the following list the genera and species enumerated by Burmann are arranged alphabetically.

### **Antholyza** Linn.

*A. aethiopica* Burm. Two sheets= **A. praealta** Red., which differs from the type of *A. aethiopica* Linn. in the Linnean Herbarium by its much broader leaves and by the upper part of the tube of the flower being rounded into the slender part, while in the true *A. aethiopica* it is truncate there.

*A. alethroides* Burm.= **Watsonia aletroides** Ker. Burmann, by some error, has misspelt the generic name *Aletris* from which he derived his specific name, therefore Ker's more correct spelling of the name should be maintained.

*A. caryophyllacea* Burm. I do not match this species at Kew. It is a true *Antholyza*, with entire (not bifid) style-arms, and it is not at all like *Watsonia humilis* Mill., to which Baker has referred it as a synonym. Burmann's specimen is evidently the type of the figure in Houttuyn, Handleid. xii, 63, t. 79, f. 3, as that excellent figure exactly represents Burmann's specimen in every detail.

*A. cunonia* Burm.=**A. cunonia** Linn.

*A. Meriana* Burm. One sheet so named=**Watsonia Meriana** Mill. Two sheets=**Watsonia brevifolia** Ker and three sheets=**Watsonia humilis** Mill.

*A. quadrangularis* Burm. This is probably the same as a specimen at Kew labelled as having been "obtained from the Ceres exhibit, Cape Town Flower-show, Oct. 1917," but the Kew specimen is without leaves. Burmann's type is not in the least like the plant that appears to be considered by South African botanists as being *A. quadrangularis*, and is perfectly distinct from the plant described as *A. quadrangularis* by Baker in Fl. Cap. ii, 166. The latter is founded upon the plant originally figured as *Gladiolus abbreviatus* Andrews, Bot. Rep. t. 166, and must therefore take the name of **Antholyza abbreviata** Pers.

*A. revoluta* Burm. No specimen; but according to the description it is now almost certain that it cannot be the plant that Baker and South African botanists call *A. revoluta*. See also under *Gladiolus angustus* Burm.

*A. ringens* Burm.=**Babiana ringens** Ker. One sheet so named is however **Babiana Thunbergii** Ker.

#### **Crocus** Linn.

"*C. capensis* Burm. a?" A specimen so named, which is probably that to which Burmann refers as having "floribus violaceis," is typical **Romulea rosea** Eckl. This is the only specimen named *C. capensis* in the collection.

*C. sativus* B. Herb. Burm. is probably intended for *C. sativus latifolius* Burm. The specimen consists of the flowers of a *Crocus* and the leaves of some other plant, possibly a *Colchicum*.

*C. triflorus* Burm. This is *Romulea sublutea* Baker, which he identifies with *Ixia sublutea* Lam. (1789), but as Burmann's name is older (1768), and I also doubt the correctness of Baker's identification, I propose to change the name to **Romulea triflora** N. E. Br.

#### **Gladiolus** Linn.

*G. alatus* Burm. is partly **G. alatus** Linn. and partly an allied species not matched at Kew. Another specimen so named is a species of *Ixia*.

*G. alopecuroides* Burm.=**Micranthus alopecuroides** Eckl.

*G. angustus* Burm. This is not *G. angustus* Linn., but is the plant which Baker and South African botanists call *Antholyza revoluta* and which=*Gladiolus Watsonius* Thunb., but it is now evident that it cannot be the true *Antholyza revoluta* Burm. Another sheet marked as being "*G. angustus*" is **Sparaxis fimbriata** Ker.

*G. capitatus* Linn. No specimen, and is probably merely quoted from Linné.

*G. carneus* Burm.=**G. carneus** La Roche as understood by Baker.



*G. communis* Burm., not of Linné. One specimen so named is **G. villosus** Ker; another is a fine species that I do not match at Kew, but as it is leafless it cannot be described. Other specimens belong to **Watsonia rosea** Ker.

*G. corymbosus* Burm. This name is omitted by Baker from all his works on Iridaceae, but the plant proves to be the well known *Freesia refracta* Klatt, which must now take the name **Freesia corymbosa** N. E. Br.

*G. galeatus* Burm.=**G. alatus** Linn., which was published eight years earlier.

*G. involutus* Burm., not of La Roche. One specimen=**G. linearis** N. E. Br. (= *Ixia linearis* Linn. f = *Gladiolus biflorus* Klatt); and another specimen is a species of *Gladiolus* I cannot name.

*G. junceus* Burm. This is the well known **Geissorhiza secunda** Ker, founded upon *Ixia secunda* La Roche, a name two years older than that of Burmann.

*G. laceratus* Burm. No specimen.

*G. permeabilis* La Roche. No specimen.

*G. plicatus* Burm. Burmann gives no description, but quotes Miller, Fig. of Pl. t. 155, fig. 1, and Breyne, Ic. Rar. Pl. p. 22, t. 9, f. 2, for the plant. But these two figures represent two different species of *Babiana*, and as the specimens in his herbarium named *G. plicatus* belong to several different species of *Babiana* and to one species of *Gladiolus*, which latter I cannot match at Kew, I suggest that the plant figured in Bot. Mag. t. 576, named by Ker *Babiana plicata*, be taken as the type of the species, especially as it seems to be the same species as that represented by Breyne in the figure and description above quoted, and also by specimens in Burmann's herbarium.

*G. pyramidalis* Burm. No specimen so named. But there is a specimen from which a name on the bottom of the sheet has evidently been cut off, and which bears on one label with it the name "*Watsonia pyramidata et spicata*," and on another label "*Ixia foliis nervosis fl. pyramidalis tubuloso carneo*." This is possibly the plant Burmann intended by the name "*G. pyramidalis*." It is a species of **Watsonia** allied to *W. brevifolia* Ker, but I cannot match it at Kew. It agrees very well with the description of *G. pyramidalis* Burm. As I find that some of the names under which Burmann described his plants have been crossed out, and other (sometimes unpublished) names substituted, it is quite possible that if this is the type of *G. pyramidalis* Burm., the name for some reason may have been removed from the sheet.

*G. ramosus* Burm., not of Linné. Burmann gives no description of this plant, but quotes for it the plant illustrated by Miller, Fig. of Pl. t. 235, f. 2, which is also the type of *Gladiolus recurvus* Linn., published one year earlier (1767), and is not the plant that Baker and South African botanists call *G. recurvus*. The plant in

Burm. herbarium named *G. ramosus* appears to be a species of **Acidanthera**, which I do not match at Kew.

*G. recurvus* Herb. Burm. This name is not mentioned in Burmann, Fl. Cap. Prodr., but, as he has labelled the specimen "*Gladiolus recurvus* Linn. Nat. Hist. ii. D. xii. Stuckbl. Pl. lxxix. fig. 1," I looked at that figure in the work also known as Houttuyn, Handleid. Plant- en Kruidkunde xii, 49, t. 79, f. 1, and found that it represents the actual specimen from which Houttuyn's figure was drawn, and apart from the bad colouring it is a faithful representation of the specimen natural size. The plant is a species of *Antholyza* which I do not match at Kew; but it is not *Gladiolus recurvus* Linn., and as that specific name is not applicable to it I propose to call it **Antholyza acuminata** N. E. Br. in allusion to the long and narrow acuminate lobes of the flower, syn. *Gladiolus recurvus* Houtt., not of Linné.

*G. tristis* Burm. This is partly *G. tristis* Linn., partly *G. grandis* Thunb., and partly *G. recurvus* Linn., not of other authors.

*G. tubulosus* Burm. This plant proves to be the same as *Micranthus fistulosus* Eckl., therefore that species should now be known as **Micranthus tubulosus** N. E. Br.

*G. villosus* Burm. This is the plant known as *Synnotia bicolor* Sweet, but as Burmann's name is older it must now be called **Synnotia villosa** N. E. Br. The figure of it which Burmann quotes (Breyne, Ic. Rar. Pl. p. 22, t. 8, f. 2) is a fairly good one, and quite unmistakable.

### **Iris Linn.**

*I. capensis* Burm. This proves to be the well known Spanish species, **I. xiphium** Linn., and is not a South African plant.

### **Ixia Linn.**

*I. africana* Burm. = **Aristea africana** Hoffmansegg.

*I. arcuata* Burm. No specimen.

*I. bulbifera* Burm. Specimens so named belong partly to **Sparaxis bulbifera** Ker, and partly to **S. fimbriata** Ker. One specimen named "*I. bulbifera*?" is a species of **Tritonia**, which I do not match at Kew, but which is near *T. lineata* Ker.

*I. bulbocoides* La Roche. No specimen, the name being probably merely copied into the list from La Roche.

*I. campanulata* Houtt. The type of Houttuyn's figure and description, published in 1780, is in Burmann's herbarium, and upon the sheet is written in pencil the name "*Ixia crateroides* Ker" in the handwriting of Salisbury, so that from this and other sheets bearing his handwriting it appears that Salisbury saw and examined the specimens in Burmann's herbarium. But as I find *I. campanulata* to be identical with *Ixia speciosa* Andr., which was not published until 1801, the name **I. campanulata** Houtt. must supersede *I. speciosa* Andr. The plant which Baker (Fl. Cap. vi. 80) has wrongly

identified with *I. campanulata* Houtt. must be given a new name, and all the references and synonyms quoted by him under *I. campanulata* excluded. I propose for it the name ***Ixia dispar* N. E. Br.**, the type being Cooper 3611, from near Worcester, which is labelled as having "pink" flowers. It is allied to *I. elegans* N. E. Br., but has much broader leaves.

*I. caryophyllacea* Burm. No specimen so named, but there is one specimen written up "*Ixia caryophyllcea*" which agrees with the description in having whitish or white flowers marked with a yellow spot on one (or more?) of the lower segments, and is no doubt the plant Burmann intended by the name *I. caryophyllacea*. This plant is the same as *Freesia xanthospila* Klatt, so that the latter name should give place to ***Freesia caryophyllacea* N. E. Br.** With the flowers are mounted two leaves of some *Babiana*.

In the Geneva herbarium are also several specimens named "*Ixia caryophyllacea*," but these have blue flowers, and belong to ***Lapeyrousia azurea* Eckl. and *L. corymbosa* Ker.**

*I. corymbosa* Burm. Several specimens so named. Two of them = ***Lapeyrousia corymbosa* Ker**, one of which is the very specimen from which the figure of *I. corymbosa* in Houttuyn, Handleid. xii, 18, t. 77, fig. 1 was made. Other specimens are identical with a species of *Babiana* which equals MacOwan, Herb. Austr. Afr. 584 and 586; one with a species of *Babiana* I do not match at Kew, and one is ***Sparaxis grandiflora* Ker.**

*I. crocata* Burm. Partly = ***Tritonia crocata* Ker**, according to Baker, but I suspect that when dried this species is confused with *T. miniata* Ker. And partly = ***Tritonia deusta* Ker.**

*I. Fabricii* Burm. Herb., not of La Roche. One specimen is ***Geissorhiza secunda* Ker**, and another is ***Geissorhiza excisa* Ker.**

*I. flabellifolia* La Roche. There are four sheets of specimens bearing this name in Burmann's herbarium. Three of them belong to species of *Babiana* that I do not match at Kew, and which do not agree with the description of La Roche, inasmuch as none of them has more than one branch to the stem, the flowers are always distichous, never secund, the tube of the flower is not or scarcely twice as long as the bracts and the style is far exserted from the tube of the flower and much longer than the stamens. Therefore none of these specimens can be the type of *I. flabellifolia*.

The fourth specimen, however, seems to exactly agree with La Roche's description, for it has seven basal leaves arranged in fan-like manner, two stem leaves, one under each of the two branches, the flowers when in bud are distichous and those expanded are secund, and the tube of the flower is twice as long as the bracts. The only discrepancy is that the style is exserted from the tube and as long as the stamens. The name "*I. flabellifolia*" is in a different handwriting from that on the other sheets, and I believe it to be the writing of La Roche, but the name has been crossed out by Burmann and

the unpublished name "*axillaris*" substituted, which is also written on two of the sheets of *Babiana* above mentioned. Yet, as the specimen so accurately agrees with the description of *Ixia flabellifolia* in all characters except the length of the style, I think there can be no doubt that it is the type of that species. This plant is the same as *Acidanthera capensis* Benth. and should now take the name of *Acidanthera flabellifolia* N. E. Br.

*I. flexuosa* Burm. There are eight sheets so named in Burmann's herbarium containing specimens of *Ixia patens* Ait., *I. candida* Eckl.; *I. nigroalbida* Klatt; *I. campanulata* Houltt.=*I. speciosa* Andr.; *I. maculata* Linn.; *Sparaxis bulbifer* Ker and *Tritonia* sp. As he does not give a description, and the figure he quotes for the plant in Miller, Figures of Plants t. 156, f. 2, had previously been named *I. Milleri* by Berg, it appears that the name *I. flexuosa* cannot in any way be maintained.

*I. grandiflora* La Roche=*Sparaxis grandiflora* Ker. One of the specimens is the type of the figure in Houttuyn, Handleid. xii, t. 77, f. 3. One specimen named *I. grandiflora* is a species of *Babiana*.

*I. imbricata* La Roche. One specimen = *Geissorhiza imbricata* Ker, and may be the true *I. imbricata* La Roche, but the flower-stem is not branched as he describes. Another specimen is a *Babiana* that together with several other distinct species is placed by Baker under *B. stricta* Ker, but is not that species. Another specimen is a very distinct species of *Babiana* which I do not match at Kew. And a fourth specimen=MacOwan, Herb. Austr. Afr. 584 and 586, wrongly named *B. stricta* var. *rubrocyanea* by Baker.

*I. latifolia* La Roche. This is the type specimen of La Roche. I do not match it at Kew, but the plant is a very distinct species of *Tritonia*=*Tritonia latifolia* N. E. Br. (*Geissorhiza latifolia* Baker).

*I. maculata* Burm. is partly *I. maculata* Linn., partly *I. erecta* Thunb., and partly a species of *Tritonia* near *T. lineata* Ker, but not that species, the lobes of the flower being more pointed and less conspicuously veined; and as *T. lineata* is an eastern species and the eastern part of the country was quite unexplored in Burmann's time, he would not be likely to have any plants from that part.

*I. monadelpha* La Roche. The type specimen of the species, which is correctly understood.

*I. monanthos* La Roche. The type specimen of the species, labelled, in the handwriting of La Roche, I believe, "*Ixia monanthos* L. R. flava maculata. Floruit 1759." It is a species of *Sparaxis* not represented at Kew, but allied to *S. lineata* Sweet and *S. tricolor* Ker, differing in its bracts and colour of the flowers, and most certainly distinct from *S. grandiflora* Ker, to which Baker has referred it. The following is a description of it.

*Sparaxis monanthos* N. E. Br. Leaves erect, 9-12 cm. long, 6-9 mm. broad, broadly linear, slightly hooked-incurved at the tips.

*Peduncle* 16 cm. long, 1-flowered, probably a weak plant. *Bracts* 15 mm. long, including the bristles into which they are divided for half their length, pallid, with brown edges and bristles. *Perianth-tube* about 7 mm. long; lobes about 2.5 cm. long and 8 mm. broad, linear-oblong, obtuse, yellow with a large blackish spot above the base. Style exceeding the anthers; stigmas 7 mm. long.

*I. ovata* Burm. No specimen.

*I. paniculata* La Roche. The specimen so named by Burmann is not *I. paniculata* La Roche, but an entirely different species, with very different bracts, and flowers which have a much shorter tube. I do not match it at Kew, and the specimen is leafless.

*I. pigmaea* Burm. This plant is *Babiana macrantha* MacOwan, which must now take the name **B. pygmaea** N. E. Br. Burmann has described the leaves as glabrous, but this is not the case, they are pubescent. The plant Baker has mistaken for *I. pigmaea* Burm. and described as *Babiana pygmaea* is *Babiana nana* Spreng.

*I. polystachya* Burm.=**I. polystachya** Linn., and the form mentioned as having violaceous flowers is **I. columellaris** Ker.

"*I. quadrangularis*? La Roche, Dissert. no 2."=**Geissorhiza secunda** Ker. If this is the plant Burmann intended by his published name "*I. quadrangularis* La Roche" it cannot be that species.

*I. scillaris* Burm. and of Linn.=**Tritonia scillaris** Baker, but one specimen=**Geissorhiza setifolia** Eckl.

*I. secunda* Burm., not of La Roche. One specimen so named =**Babiana** sp. and is the same as *Gladiolus* sp. sheet i of Herb. Thunberg. Another is **Babiana plicata** Ker, as in Bot. Mag. t. 576. Other specimens are unidentified species of *Babiana* and one is **Geissorhiza rochensis** var. **spithamea** Ker ex Baker.

*I. spicata* Burm. This proves to be *Hesperantha cinnamomea* Ker. But as Burmann's name was published in 1768, while *Ixia cinnamomea* Linn. f. was not published until 1781, the name must be changed to **Hesperantha spicata** N. E. Br.

*I. thyrsiflora* La Roche and of Burm. This name Baker has wrongly referred to *Ixia flexuosa* Linn., but the plant is an *Aristea*, and must take the name **Aristea thyrsiflora** N. E. Br.=*A. major* Andr. (1801)=*A. capitata* Ker (1802), as La Roche's name is much older than those of Andrews and Ker.

*I. triticea* Burm.=**Antholyza triticea** N. E. Br.=*A. lucidor* Linn. f. *Ixia triticea* Burm. has been mistaken by authors for *Micranthus plantagineus* Eckl., but it is identical with the plant described by the younger Linné as *Antholyza lucidor*. I therefore restore its older name.

Another and very similar species has been confused with *A. triticea*, in habit and foliage it is the same, but its flowers have a tube about 30 mm. long and segments 16–20 mm. long, whereas in *A. triticea* the tube is only 20–25 mm. and the segments 10–12 mm. long. This larger-flowered plant I propose to call **Antholyza**

**Burchellii** N. E. Br. It was collected in Caledon Division; between Donker Hoek and Houw Hoek Mountains, *Burchell* 8013 (the type), and Donker Hoek Mountains, *Burchell* 7962.

*I. tubulosa* Burm. There are four specimens so named, two of them=**Babiana tubulosa** Ker and must be regarded as the types of that species. They belong to the form that Burmann describes as having broader leaves contracted into a petiole as long as the blade. The other two specimens belong to the genus *Acidanthera* and, having linear leaves and apparently whitish flowers, correspond to the form Burmann describes as having rush-like leaves and whitish flowers. One of these two is a luxuriant cultivated specimen of **Acidanthera flabellifolia** N. E. Br. (*Ixia flabellifolia* La Roche). The other is the type of *Ixia tubulosa* Houttuyn, Handleid. xii, t. 78, f. 2, which is so exact a representation, natural size, of Burmann's specimen that a photograph would scarcely give the outline more correctly. I do not find any specimen at Kew like it. But Baker, who I know held the opinion that Houttuyn's figures were very poor drawings, mistook Houttuyn's figure for a bad representation of *A. exscapa* Baker, and, having made this misidentification without having seen Houttuyn's type, changed the name of *A. exscapa* to *A. tubulosa*. I therefore propose that Houttuyn's type in Burmann's herbarium should take the name **Acidanthera tubulosa** N. E. Br. and that *A. tubulosa* Baker be quoted as a synonym of **A. exscapa** Baker.

*I. umbellata* Burm. No specimen.

*I. undulata* Burm. This plant is a *Tritonia* and has been completely misunderstood by Ker and by Baker, who have wrongly supposed it to be the same as *Ixia crispa* Linn. f. I fail to match the type of *Ixia undulata* Burm. Fl. Cap. Prod. p. 1\* with any specimen at Kew, and therefore give the following more complete description of it.

**Tritonia undulata** N. E. Br. The specimen is 12 cm. high, with three basal leaves 6–7.5 cm. long and about 6 mm. broad at the base, thence gradually tapering to a fine awn-like point, and the whole leaf crisped at the edges and undulated and twisted. *Stem* slender, with two reduced leaves 14–16 mm. long below its middle, and a lax spike of three developed flowers and three aborted buds. *Bracts* 4–5 mm. long, the outer ovate, obtuse, veinless, brown. *Perianth* with a slender tube 10–12 mm. long and oblong lanceolate obtuse lobes about 10 mm. long and 3 mm. broad.

This species is nearly allied to *T. crispa* Ker but is smaller and the flowers are not half as long.

As *Ixia crispa* Linn. f. has hitherto been mistaken for *I. undulata* Burm. but is a different species, and as the specific name "*crispa*" has already been used in the genus *Tritonia* I propose to change the name and call it **Tritonia Thunbergii** N. E. Br. (syn. *T. undulata* Baker, *Ixia crispa* Linn. f.).

### **Morea Mill.**

*M. juncea* Burm. No specimen.

*M. vegeta* Burm.=***M. juncea* Linn.**

### **Phalangium Burm.**

*P. obsoletum* Burm. No specimen. Burmann quotes for this plant the figure in Plukenet, Phytog. t. 187, f. 3, which is probably intended for some species of *Anthericum*. But Burmann also quotes this same figure under *P. ramosum* together with that in Miller, Figures of Pl. t. 56, which also represents a species of *Anthericum*.

*P. ramosum* Burm. According to the type specimen and the description this plant is *Melasphaerula graminea* Ker, but as Burmann's name is older than *Gladiolus gramineus* Linn. f. upon which Ker's name was founded, and the plant is probably the same as that intended by the name *Gladiolus ramosus* Linn. (1762), the name should be changed to ***Melasphaerula ramosa* N. E. Br.** The figure in Miller, Figures of Plants t. 56, quoted by Burmann for this species, is not an Iridaceous plant, but a species of *Anthericum*.

It may be well to point out here that the name *Melasphaerula* is wrongly spelt *Melasphoerula* in Flora Capensis, vi, 115.

*P. spicatum* Burm. Here, again, the figure in Plukenet, Almagestum, t. 310, f. 1, quoted by Burmann as representing this species, does not accord with his type specimen, which is identical with the plant Baker has named *Micranthus plantagineus* var. *juncea*. The figure of *Phalangium spicatum* in Houttuyn, Handleid. xii, 115, t. 80, f. 2, was, as mentioned in other cases, undoubtedly drawn from Burmann's type specimen and correctly represents it. As this plant is quite distinct from *M. plantagineus* Eckl., and as the name *M. spicatus* has already been used for another plant, I propose to call it ***Micranthus junceus* N. E. Br.**

### **Vieusseuxia La Roche.**

*V. aristata* Burm. not of La Roche. The herbarium contains three sheets so named. The principal one, and probably that intended to bear the name=***Morea villosa* Ker**, and from this specimen the figure in Houttuyn, Handleid. xii, t. 80, f. 1, named *V. aristata* was evidently drawn; but this specimen is certainly *M. villosa*, and has pubescent leaves and purplish flowers.

Another sheet contains a species of ***Hexaglottis*** and the third sheet contains a flowerless specimen of a ***Morea*** I do not match at Kew.

*V. fugax* Burm., not of La Roche. There are two sheets bearing this name, and one of them also bears it in the handwriting of A. P. De Candolle, but also on the sheet the specimen is stated to have "floribus flavis" and is certainly not the true *V. fugax* La Roche, but identical with *V. spiralis* La Roche and *V. Bellendeni* Sweet, figured in Bot. Mag. t. 772 as *Morea tricuspsis* var. *lutea* Ker. As the

specific name "*spiralis*" has already been used under the genus *Morea*, and as this plant is quite distinct from *M. tricuspis*, I propose to name it **Morea Bellendeni** *N. E. Br.*

Another sheet named *V. fugax* contains an unnamed species of **Hexaglottis**.

*V. spiralis* La Roche. No specimen.

In the Geneva herbarium is a specimen named by A. P. De Candolle "*Vieusseuxia pavonia* Decand.", and is doubtless one of the plants included in his account of this species in *Ann. Mus. Nat. Hist.* ii, 139, but the specimen appears to me to belong to **Morea villosa** Ker, rather than to *M. pavonia* Ker.

## XXVI.—MISCELLANEOUS NOTES.

MR. G. N. HERRINGTON has been appointed by the Secretary of State for the Colonies, an Agricultural Instructor, in the Education Department, Nigeria.

The following appointments at the Royal Botanic Gardens, Kew, have been made by the Minister of Agriculture and Fisheries:—

Mr. N. Y. SANDWITH and Mr. F. BALLARD to be Temporary Assistants in the Herbarium.

Mr. C. E. HUBBARD and Mr. E. W. B. H. MILNE-REDHEAD to be Temporary Sub-Assistants in the Herbarium.

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RETIREMENT OF CURATOR.—The retirement of Mr. WILLIAM JACKSON BEAN, I.S.O., on 20th May, under the age limit, has brought to a conclusion a career of long duration in the public service and of great distinction in the horticultural world.

Mr. Bean entered Kew as a Student Gardener on April 2nd, 1883. His ability was speedily recognised and he was advanced to the position of Sub-foreman in charge of the orchid and other tropical collections in October of the same year. In 1888 he was promoted to be Foreman in charge of the Temperate House department. In 1892 he became Foreman in charge of the Arboretum and it was in this department that he built up the unrivalled knowledge of trees and shrubs which has earned for him a world-wide reputation and which has been made available to tree-lovers at large in his well-known book "*Trees and Shrubs hardy in the British Isles*."

In 1900 the value of Mr. Bean's services was recognised by his position being raised to the rank of Assistant Curator.

On 1st June, 1922, on the retirement of the late Mr. W. Watson, Mr. Bean was appointed Curator, a position in which his sound business ability and administrative capacity have been no less marked than his technical knowledge.

In 1917 the Royal Horticultural Society conferred on Mr. Bean the Victoria Medal of Honour in Horticulture, and in 1924 he received the distinction of being created a member of the Imperial Service Order.



In succession to Mr. Bean, the Minister of Agriculture and Fisheries has appointed as Curator, MR. THOMAS WILLIAM TAYLOR, Assistant Curator in charge of the Tropical Department.

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RICHARD HENRY YAPP, who died on January 22nd, 1929, after a long illness, was born at Orleton, Herefordshire, in 1871, and graduated B.A. from St. John's College, Cambridge, in 1898, and M.A. in 1903. He was placed in the first class in both parts of the Natural Science Tripos, and was Frank Smart Student of Botany at Gonville and Caius College, 1899-1902, and Curator of the Cambridge University Herbarium from 1900 to 1903. Together with the late Prof. D. T. Gwynne-Vaughan he accompanied the Cambridge University Scientific Exploring Expedition to the Malay States in 1899-1900, where he made large collections of plants, which he determined at Kew during vacations. In 1904 he was called to the Professorship of Botany at University College, Aberystwyth, where he remained until 1914. From 1914 to 1919 he was Professor at Queen's University, Belfast, and in the latter year succeeded Dr. G. S. West as Mason Professor of Botany in Birmingham University, where he remained until his death.

He went to South Africa with the British Association in 1905, and was elected president of the botanical section for the Glasgow meeting in 1928, but resigned on account of ill health.

His favourite subject was ecology, on which he published an article on the vegetation of Wicken Fen, on *Lecanopteris carnosa* and ants, and other papers in the Journal of Ecology. In 1921 he was President of the Ecological Society. His text-book of Botany was published by the Cambridge University Press. C. H. W.

JOHN MERLE COULTER. We regret to learn of the death of Prof. John Merle Coulter at Yonkers, New York, on December 23rd, 1928. Prof. Coulter's early work was mostly in the field of taxonomy and he published various books and papers dealing with the systematics of North American plants. In this country he is chiefly known for his work on the morphology of Angiosperms and Gymnosperms, and his well-known text-books (with C. J. Chamberlain) on these groups are in constant use. The advanced text-book issued in collaboration with C. R. Barnes and H. C. Cowles is often considered the best in the English language. With the assistance of M. C. Coulter he also published the very useful book *Plant Genetics*. As the founder, and for more than half a century the editor, of the *Botanical Gazette* Prof. Coulter attained eminence as a botanical editor. In his own country his greatest single influence was as a teacher, and it is recorded that he was "an inspiring lecturer, a splendid counselor, and a devoted friend." W.B.T.

ERNEST ELLMAN.—The death of the Rev. Ernest Ellman at Bath on January 30th, at the age of 74, removes a picturesque figure

from the narrow circle of British botanists. Although he neither formed a collection nor published, his extraordinary enthusiasm for searching for plants and noting their habitats, associations and distribution, led him to travel extensively over Western Europe and brought him in touch with many systematists both at home and on the Continent. In Britain, he held a succession of curacies in the southern counties, and botanized especially in his native Sussex, in Somerset, Kent and Cornwall, his records adding considerably to the knowledge of their respective floras. Abroad, he had worked the Alps and the Riviera with particular care, and of late years had turned his attention to the wonderfully rich flora of the Iberian Peninsula. Since the war he visited Spain at least six times, at first in company with either M. Jahandiez or Messrs. Cedric Bucknall and J. W. White ; but on the last four occasions he invited one or other of the younger botanists from Kew to accompany him, and the resulting collections were presented to the Herbarium. These, together with others from the Pyrenees and from Switzerland, amount to nearly three thousand gatherings of interesting plants. Mr. Ellman's name is commemorated in a new *Juncus* and a new *Teucrium* which were collected on his Spanish expeditions (*Kew Bull.* 1928, no. 4, pp. 151, 153). N.Y.S.

**Plants from Spain.**—The last collection made by the Rev. E. Ellman in south-east Spain with Mr. N. Y. Sandwith has now been named and incorporated in the Herbarium.

On this occasion, several particularly interesting and rich localities were worked, notably the remote and rarely visited Cabo de Gata, south-east of Almeria, where several of the remarkable endemics, including the spiny *Antirrhinum Charidemi*, were collected ; the Sierra Alhamilla and Barranco del Caballar near Almeria, which abound in species of an African type occurring nowhere else in Spain or in Europe ; Velez-Rubio ; Lorca, for the endemic Crucifer, *Guiraoa arvensis* ; Alicante ; and the famous district of Denia, which provides a number of the rarest and most interesting Spanish species. These Denia plants, described by the old botanists Cavanilles and Webb, remained legends until as recently as 1883 and 1884, when this part of the coast was at last revisited by Rouy and by Mr. C. C. Lacaita. In a week at Denia nearly all the specialities were collected, including the splendid endemic *Carduncellus dianius* Webb, *Convolvulus valentinus* Cav. and *Erucastrum brachycarpum* Rouy, all in their *locus classicus* and hitherto unrepresented at Kew. Other additions to the Herbarium made during this expedition included two very rare and little known species of *Helianthemum*, *H. cinereum* Cav. and *H. Rossmuessleri* Willk., *Dianthus Charidemi* Pau, *Galium valentinum* Lge., *Filago fuscescens* Pomel, *Centaurea Aemiliae* Font Quer (*C. aspera* x *Seridis*), *C. Mongoi* Pau, *Sideritis hirsuta* var. *maritima* Font Quer, and *Teucrium hifacense* Pau from the curious promontory of Hifac, between Alicante and Denia.

This was the spot where Boissier was forced to land on his first hazardous voyage down the Spanish coast in 1837, and where he discovered his new *Helianthemum caput-felis* on the low rocks connecting the cliff with the mainland. This is still the only known Spanish locality, although it has since been discovered in the Balearic Islands and Algeria.

**Campanula orphanidea Boiss.**—This species was described in the Flora Orientalis iii. 897 (1875) from specimens collected on Mt. Athos by Aucher-Eloy, Frivaldsky, Orphanides, and Pichler. Boissier correctly reduces the *C. calaminthifolia* of Grisebach in Spic. Flor. Rumel. ii. 286 (1844) non Lam. Dict. i. 585 (1785), as the plant collected on Athos by Friedrichsthal was named. Davidoff [Trav. de la Soc. Bulg. d. Sc. nat. viii. 91 (1915)] described a plant as a new species under the name *C. bulgarica*, a name already used for a microspecies of the *C. rotundifolia* group by Witasek [Mag. Bot. Lap. v. 244 (1906)]. In their Flora Bulgarica 1082 (1925) Stoyanoff and Stefanoff reduce Davidoff's plant to *C. orphanidea* Boiss. A plant collected by Dr. Stoyanoff on Mt. Ali-Botusch and referred to *C. orphanidea* did not quite agree with authentic material of this species at Kew and we therefore obtained the loan of additional material from Sofia. An examination of this has convinced us that the above nomenclature concerns only one species and that Stoyanoff and Stefanoff are correct in their reduction of Davidoff's *C. bulgarica*.

The specimens compared by us can be arranged in a remarkably graded series of which the extremes by themselves would appear worthy of specific rank. The specimens from Mt. Athos are fairly uniform. They have relatively stiff stout stems with from one to seven flowers which are nearly sessile, the calyx segments in the flowering condition are about 7 mm. in length, and the whole plant has a dense whitish indumentum. Davidoff's plant (from western Thrace, near Xanthi, on calcareous rocks, May 26, 1914) is practically indistinguishable from the Athos plants. Specimens collected by Stoyanoff and Stefanoff in the central Rodope, July 1924, have slightly more slender stems, are less hairy—the whole plant being more green, and the calyx segments more slender and more pointed. Lastly we have the specimens collected in rocky places on Mt. Ali-Botusch by Dr. Stoyanoff, July 10, 1920. These have extremely slender stems with most often only one flower to each, the calyx segments in the flowering condition are 1 cm. or more in length, and the white indumentum is present but is less conspicuous than in the Athos plants. The last named specimens we have labelled forma *gracilis*.

Boissier (l.c.) places the species in Sect. *Media* Subsect. *Quinqueloculares*. This is certainly incorrect; the species has always three carpels. The calyces are exappendiculate and the affinity seems to be with the series *Saxicolae* in the Subsect. *Triloculares*.

E. MILNE-REDHEAD & W. B. TURRILL.

**Name changes in *Gomphostigma* Turcz.**—The name *G. incomplum* (Linn. f.) N.E. Br. should supersede *G. incanum* Oliv. in Hook. Ic. Pl. t. 1472, as that plant proves to be identical with the type specimen of *Buddleja incompta* Linn. f., with which, by the courtesy of Dr. N. E. Svedelius of Upsala, I have had the opportunity of comparing it. *B. incompta* was omitted from the Flora Capensis. Thunberg states that he collected the plant in the Roggeveld, in Calvinia Division.

Similarly the name *G. virgatum* O. Kuntze; Rev. Gen. Pl. iii, 201, should supersede *G. scoparioides* Turcz., as the latter is identical with the type of *Buddleia virgata* Linn. f., a much older name.

N. E. BROWN.

**Conservation of the name *Gardenia*.\***—Mr. O. A. Farwell has kindly drawn attention to a bibliographical note published by him in the "American Midland Naturalist," vol. viii. p. 34 (Jan. 1922), in which he revived the name *Gardenia* Colden (1756) which has been included by Boehmer in the third edition of Ludwig's *Definitiones Generum Plantarum* (1760), but had otherwise been overlooked or ignored in botanical literature for over 160 years. *Gardenia* Colden is a prior name for *Triadenum* Raf. (1808), which is commonly reduced to *Hypericum*, but is regarded by some botanists in the United States as an independent genus. Under a strict application of the International Rules of Nomenclature the existence of the effectively published and technically valid name *Gardenia* Colden invalidates the name *Gardenia* Ellis (1761), which has been used for 169 years for an important genus of Rubiaceae, comprising over 100 species, including the "gardenia" of florists. In the light of the facts unearthed by Mr. Farwell, it is evidently desirable that *Gardenia* Ellis should be conserved, and it is therefore being added to a list of nomina generica conservanda which will be submitted for the consideration of the International Botanical Congress, 1930.

T. A. SPRAGUE.

**Malay Poisons and Charm Cures.†**—The first edition of Dr. Gimlette's book appeared in 1915, and the second in 1923: this, under review, is the third; it has the arrangement of the second, but is somewhat enlarged by new matter interpolated in all its parts. One-third of the book describes the charms by which a Malay seeks to alter the course of events in his favour, the rest the poisons by which those criminally inclined may endeavour to gain advantages—poisons used more often for gain or to annoy rather than for murder. The poisons of vegetable origin number 33; and a few accessory materials from other plants are discussed also.

The book is interesting, many-sided and excellent; it is particularly valuable, as the approval of the Government of the Federated

\*Vide *Kew Bull.* 1929, p. 12.

†Malay Poisons and Charm Cures, by John D. Gimlette. J. and A. Churchill, 40, Gloucester Place, W. 1., 1929, pp. xiii + 301, plates 3, price 10s. 6d.

Malay States shows, from an administrative standpoint, because it throws light upon actions which from various motives are done in the shadow of secrecy.

On p. 195 for *Carapa malaccensis* read *Carapa moluccensis*; and on p. 225 for *Unona dasmychala* read *Unona dasymaschala* or else *Desmos dasymaschala*.  
I.H.B.

**Coniferae :\*** KEYS TO THE GENERA AND SPECIES, WITH ECONOMIC NOTES.—In this work the endeavour of the author, Mr. H. M. FitzPatrick, an ex-student of the College of Science, Dublin, has been to produce, in compact form, practicable keys, whereby, with the aid of a pocket lens, it may be possible to refer specimens of the *Coniferae* to their respective genera and species. The author has succeeded very well in his work and with the aid of these keys students of the *Coniferae* should experience little difficulty in placing most specimens in their correct species. With some species, however, there is always likely to be an element of doubt in the naming of very vigorous or very weak specimens, in the absence of flowers or mature cones. Cases in point are *Juniperus Sabina* and *J. virginiana*; *Cupressus macrocarpa*, *C. Goveniana* and *C. sempervirens*; and *Cedrus Libani* and *C. atlantica*. Following a short introduction Mr. FitzPatrick gives a classification of the 47 genera into which he has divided the Coniferae. In the *Cupressineae* he has taken the narrow view of *Thuya* and divided it into *Thuya*, *Biota* and *Thujaopsis*, but he has allowed the species forming the *Chamaecyparis* group of *Cupressus* to remain as a group of *Cupressus*. He has also sunk *Prumnopitys* under *Podocarpus*, which is undoubtedly the correct thing to do. It is in forming keys for the *Cupressineae* that Mr. FitzPatrick has broken new ground. Here, after giving generic descriptions he proceeds to give distinguishing leaf characters for species in different genera. Thus 33 species in 7 genera, *Cupressus*, *Thuya*, *Biota*, *Microbiota*, *Thujaopsis*, *Libocedrus* and *Fokienia*, are grouped with one another according to leaf characters. This is likely to be confusing and it would perhaps have been wise to have dealt with each genus separately. However, with the cone differences that are given there should be no real difficulty experienced in using the keys. At the end of the work are several pages of drawings by Mr. James A. Nolan depicting leafy shoots and leaf sections which add to the value of the work. If Mr. FitzPatrick would publish his keys in a small book suitable for the pocket their value would be greatly enhanced. W.D.

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\*Coniferae: Keys to the Genera and Species, with Economic Notes. By H. M. FitzPatrick, in the Scientific Proceedings of the Royal Dublin Society, Vol. 19, N.S. No. 19, April, 1929, pp. 189–260, pl. 9–15. Messrs. Hodges, Figgis & Co., 20, Nassau Street, Dublin, price 8s.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1929 ROYAL BOTANIC GARDENS, KEW

## XXVII.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*\*: III. E. M. MARSDEN-JONES AND W. B. TURRILL.

### INDIVIDUALS, CHARACTERS, AND POPULATIONS OF *S. MARITIMA* OCCURRING IN NATURE.

In the first paper of this series (*K.B.* 1928, p. 1) we dealt with the results of controlled hybridization of *S. maritima* and *S. vulgaris*. In the second paper\* we described naturally occurring hybrids between the same species. In the present account we deal only with *S. maritima* as we have studied it in wild material. We first describe a number of stock-plants which have been collected from various localities and have been used for breeding work which is not yet completed. Throughout this work we mean by 'stock-plant' an individual plant collected in the wild and transplanted to one of our breeding grounds for use in controlled crossing, selfing, or biological experiments. Seedlings from natural seed of some of the stock-plants are then described. The plant organs of *S. maritima* are considered *seriatim* and the character variations we have found are dealt with in some detail. A simple scheme to replace intra-specific nomenclature and reduce the length of descriptions is tentatively proposed. Finally, certain wild populations of *S. maritima* are described.

### Stock-Plants of *S. maritima*.

Descriptions of stock-plants A.1 and A.2 were given in our first paper of this series (*K.B.* 1928, 1).

#### A.3. Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, stems half-prostrate, up to 3 dm. long; with barren stems; much anthocyanin throughout plant.

*Leaves* very uniform on the whole though varying in length according to position, linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.5 cm. long, † 4 mm. broad, very few widely scattered short cilia, somewhat fleshy, dark glaucous green suffused with anthocyanin.

*Inflorescence* of 1 to 3 flowers, erect when in bloom. Bracts glabrous, not ciliated, lower green, herbaceous, similar to uppermost

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\*Continued from *Kew Bull.* 1929, p. 38.

†Leaf measurements are always taken from average well-developed leaves of nodes about the middle of the stems.

leaves, ovate, acute, upper smaller and narrower and becoming completely scarious.

*Calyx* broadly ellipsoid in flower, becoming broadly obovoid in fruit.

*Corolla* with the petals and segments both contiguous ; diameter 2.7 cm. Petals 2.5 cm. long, 1.4 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, anthocyanin blotch showing both above and below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, slightly narrowed in the upper part, without the teeth 7 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 4 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 2.5 mm. broad.

*Mature seeds* weak armadillo.

#### A.4. Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, stems prostrate, up to 2.75 dm. long ; with barren stems ; very much anthocyanin throughout plant.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.5 cm. long, 4-4.5 mm. broad, short well-spaced cilia on the margins, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

*Inflorescence* as in A.3.

*Calyx* broadly ellipsoid in flower, becoming broadly obovoid in fruit.

*Corolla* with the petals and segments both divergent ; diameter 2.9 cm. Petals 2.6 cm. long, 1.3 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, a small anthocyanin blotch showing below and faintly above.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, slightly contracted above, without the teeth 6 mm. long, 8 mm. broad, mouth 3.5 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 3 mm. broad.

*Mature seeds* armadillo.

#### A.5. Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, stems prostrate, up to 3 dm. long ; with barren stems ; very much anthocyanin throughout the plant particularly in the calyx.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 3 cm. long, up to 4.5 mm. broad, no cilia, absolutely glabrous, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

*Inflorescence* as in A.3.

*Calyx* narrow-cylindric in flower and fruit.

*Corolla* with the petals divergent but the segments contiguous ; diameter 2.7 cm. Petals 2.5 cm. long, 1.1 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, anthocyanin blotch showing above and below.

*Androeceum* fully functional, flowers hermaphrodite.

*Gynaeceum* with purplish stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 7 mm. broad, mouth 3 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3 mm. long, 3 mm. broad.

*Mature seeds* armadillo.

#### A.6. Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, half-prostrate, up to 4 dm. long ; with barren stems ; very much anthocyanin throughout the plant particularly in the calyx.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.8 cm. long, 3-4 mm. broad, short well spaced cilia on the margins, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

*Inflorescence* as in A.3 but 2 or 3 cilia near the apex of each bract.

*Calyx* narrow-cylindric in flower, obovoid-cylindric in fruit.

*Corolla* with the petals and segments both overlapping ; diameter 2.6 cm. Petals 2.8 cm. long, 1.5 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, anthocyanin blotch showing above and below.

*Androeceum* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 7 mm. broad, mouth 3.5 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 4 mm. long, 2 mm. broad.

*Mature seeds* armadillo.

#### A.7. Chesil Beach, Dorset, nearly opposite Wyke Regis, 1926.

*Habit* compact, stems prostrate, up to 3 dm. long ; with barren stems ; whole plant absolutely devoid of anthocyanin.

*Leaves* oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate (*i.e.* in shape similar to those of A.1 but shorter and narrower), apex acute to obtuse, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 1.6 cm. long, 4-5 mm. broad, margins distinctly ciliate, glaucous green.

*Inflorescence* as in A.3, bracts with few or no cilia.

*Calyx* ellipsoid in flower, broadly obovoid in fruit.



*Corolla* with the petals and segments both contiguous or even overlapping ; diameter 3.2 cm. Petals 2.7 cm. long, 1.8 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and white immature seeds.

*Ripe capsules* obloid\*, without the teeth 6.5 mm. long, 9 mm. broad, mouth 5.5 mm. in diameter ; teeth each an isosceles triangle, 4 mm. long, 2.5 mm. broad at the base, strongly recurved ; carpophore 3 mm. long, 2.5 mm. broad.

*Mature seeds* armadillo.

**A.8.** Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, stems decidedly prostrate, up to 4 dm. long ; with barren stems ; much anthocyanin throughout plant.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.4 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, dark glaucous green.

*Inflorescence* as in A.3.

*Calyx* broadly ellipsoid in flower becoming broadly obovoid in fruit.

*Corolla* with the petals and segments both overlapping ; diameter 3 cm. Petals 2.7 cm. long, 1.3 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with purplish stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid to obloid, without the teeth 6 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2.5 mm. broad at the base, strongly recurved, carpophore 4.5 mm. long, 3 mm. broad.

*Mature seeds* armadillo.

**A.9.** Chesil Beach, Dorset, Portland end, 1926.

*Habit* spreading, stems decidedly prostrate, up to 4 dm. long ; with barren stems ; much anthocyanin in all parts of the plant.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.3 cm. long, 4 mm. broad, margins glabrous or with only 1 to 3 cilia on each side, somewhat fleshy, dark glaucous green suffused with much anthocyanin.

*Inflorescence* as in A.3, bracts without cilia.

*Calyx* narrow-cylindric in flower, ovoid-cylindric in fruit.

*Corolla* with the petals and segments contiguous ; diameter 3 cm. Petals 2.5 cm. long, 1.3 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales small, anthocyanin blotch showing above and below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

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\*See page 160 under FRUITS.

*Ripe capsules* broadly ovoid, slightly contracted above, without the teeth 7 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2.5 mm. broad.  
*Mature seeds* tubercled.

**A.10.** Chesil Beach, Dorset, nearly opposite Wyke Regis, 1926.

*Habit* semi-prostrate, stems up to 3 dm. long ; a small amount of anthocyanin except in the leaves.

*Leaves* oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate, apex obtuse to acute, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 1.3 cm. long, 4 mm. broad, margins distinctly ciliate, somewhat fleshy, dark glaucous green.

*Inflorescence* as in A.3.

*Calyx* broadly ellipsoid in flower but somewhat more suddenly contracted upwards and gradually below than is usual, broadly obovoid in fruit.

*Corolla* with the petals contiguous or overlapping and the segments divergent ; diameter 2.8 cm. Petals 2.4 cm. long, 1.9 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, without the teeth 7 mm. long, 7 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2 mm. broad.

*Mature seeds* armadillo.

**A.11.** Chesil Beach, nearly opposite Wyke Regis, 1926.

*Habit* semi-prostrate, stems up to 3.6 dm. long ; a small amount of anthocyanin except in the leaves.

*Leaves* narrow-lanceolate to linear-lanceolate, acute, 2.2 cm. long, 5 mm. broad, margins distinctly ciliate, somewhat fleshy, dark glaucous green.

*Inflorescence* as in A.3, bracts with few cilia.

*Calyx* broadly ellipsoid in flower but a little narrowed to the base, broadly obovoid in fruit.

*Corolla* with the petals and segments contiguous ; diameter 3 cm. Petals 2.5 cm. long, 1.4 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales very well developed, no anthocyanin blotch above or below.

*Androecium* fully functional and flowers hermaphrodite except in one flower which was female.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, without the teeth 8 mm. long, 8 mm. broad, mouth 4.5 mm. in diameter ; teeth each an isosceles

triangle, 3 mm. long, 2.5 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2.5 mm. broad.

*Mature seeds* armadillo.

**A.12.** Chesil Beach, nearly opposite Wyke Regis, 1926.

*Habit* semi-prostrate, stems up to 3.6 dm. long ; whole plant free from anthocyanin.

*Leaves* oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate (*i.e.* in shape similar to those of A.1 and A.7), apex acute to obtuse, slightly apiculate, often conspicuously narrowed to the base especially in the lower ones, uppermost pair slightly amplexicaul, 2.3 cm. long, 4 mm. broad, margins distinctly ciliate, somewhat fleshy, green glaucous.

*Inflorescence* as in A.3, bracts with few or no cilia.

*Calyx* ellipsoid in flower, broadly obovoid in fruit.

*Corolla* with the petals and segments both contiguous or even overlapping ; diameter 3 cm. Petals 2.8 cm. long, 1.5 cm. broad, lamina lobed for  $\frac{2}{3}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and white immature seeds.

*Ripe capsules* broadly ovoid, without the teeth 8 mm. long, 8 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2.5 mm. broad at the base, strongly reflexed ; carpophore 4 mm. long, 3 mm. broad.

*Mature seeds* armadillo.

**A.13.** Chesil Beach, Dorset, eastern portion, near the roadside, 1926.

*Habit* prostrate, stems up to 2.5 dm. long ; a small amount of anthocyanin in the calyx only.

*Leaves* lanceolate- or oblanceolate-linear, acute, 1.8 cm. long, 4 mm. broad, margins distinctly ciliate, green glaucous.

*Inflorescence* as in A.3.

*Calyx* ellipsoid in flower, broadly obovoid in fruit.

*Corolla* petals and segments widely divergent ; diameter 1.9 cm. Petals 2 cm. long, 6 mm. broad, lamina lobed for  $\frac{2}{3}$  its length, scales poorly developed (as in F<sub>1</sub> plants), no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 6 mm. long, 7.5 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly recurved ; carpophore 3.5 mm. long, 2 mm. broad.

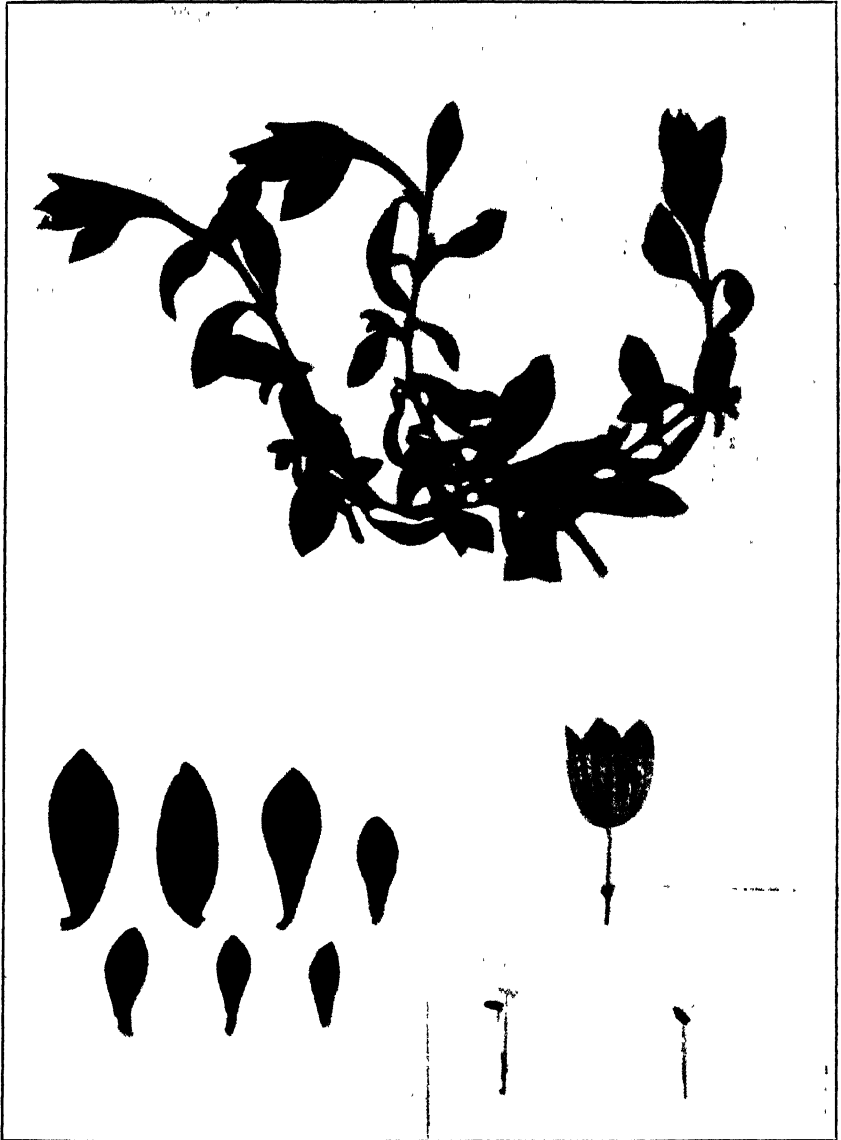
*Mature seeds* armadillo.

**A.14.** Chesil Beach, Dorset, eastern portion, near the roadside, 1926.

*Habit* prostrate, stems up to 2.5 dm. long ; a small amount of anthocyanin in all parts except the leaves.

PLATE VI

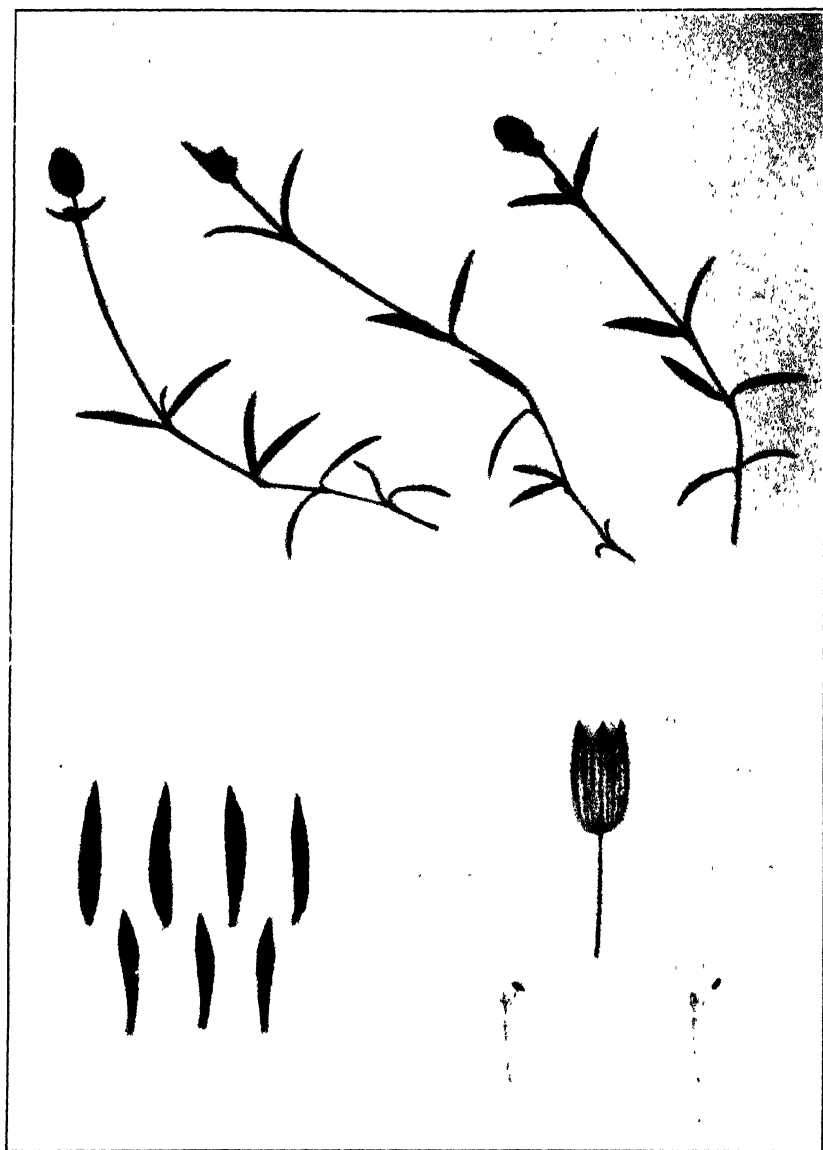
[*Kew Bulletin*, 1929



*Silene maritima*, stock-plant A. 1, Tilly Whin, Swanage, 1923.

[To face page 150.

PLATE VII



*Silene maritima*, stock-plant A. 15, Chesil Beach, Portland end, 1926.

To face page 151.]

*Leaves* ovate-lanceolate to lanceolate-ovate, acute, 1.8 cm. long, 5 mm. broad, margins with short well-spaced cilia, glaucous dark green.

*Inflorescence* as in A.3, 1-3 odd cilia on the bracts.

*Calyx* ellipsoid in flower and fruit.

*Corolla* with the petals and segments both contiguous ; diameter 2.7 cm. Petals 2.4 cm. long, 1 cm. broad, lamina lobed for  $\frac{1}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaecium* with purplish stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed ; carpophore 3.5 mm. long, 2 mm. broad.

*Mature seeds* armadillo.

#### A.15. Chesil Beach, Dorset, Portland end, 1926.

*Habit* semi-prostrate, stems up to 2.5 dm. long ; very much anthocyanin throughout the plant.

*Leaves* linear or narrowly lanceolate- or oblanceolate-linear, acute, slightly apiculate, slightly narrowed to the base, uppermost pair slightly amplexicaul, 2.2 cm. long, 3 mm. broad, very few widely scattered short cilia, somewhat fleshy, very dark glaucous green (the darkest of our stock-plants here described.)

*Inflorescence* as in A.3, bracts not ciliate.

*Calyx* narrow-cylindric in flower, obovoid-cylindric in fruit.

*Corolla* with the petals overlapping and the segments divergent ; diameter 3 cm. Petals 2.7 cm. long, 1.5 cm. broad, lamina lobed for  $\frac{1}{4}$  its length, scales well developed, anthocyanin blotch showing above and below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaecium* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 7 mm. long, 8 mm. broad, mouth 4.5 mm. in diameter ; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly reflexed ; carpophore 3.5 mm. long, 2.5 mm. broad.

*Mature seeds* armadillo.

#### A.16. Overcombe Beach, Weymouth, Dorset, 1926.

*Habit* semi-prostrate to suberect, stems up to 3 dm. long ; a small amount of anthocyanin in calyx only.

*Leaves* linear to linear-lanceolate, acute, 2.3 cm. long, 4 mm. broad, short well spaced cilia on the margins, somewhat fleshy, green glaucous.

*Inflorescence* 3- to 7-flowered, bracts with few cilia at the apex.

*Calyx* broadly ellipsoid in flower, becoming broadly obovoid in fruit.

*Corolla* with the petals and segments contiguous or slightly overlapping ; diameter 2.7 cm. Petals 2.4 cm. long, 1.5 cm. broad,

lamina lobed for  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully functional, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 5 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3.5 mm. long, 2.5 mm. broad.

*Mature seeds* armadillo.

**A.17.** Overcombe Beach, Weymouth, Dorset, 1926.

*Habit* semi-prostrate, stems up to 3.3 dm. long; much anthocyanin in the stem but not in the leaves.

*Leaves* linear to linear-lanceolate, acute, 1.8 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, dark glaucous green.

*Inflorescence* as in A.3, bracts not ciliate.

*Calyx* broadly ellipsoid in flower, becoming broadly obovoid in fruit.

*Corolla* with the petals and segments overlapping; diameter 2.8 cm. Petals 2.7 cm. long, 1.6 cm. broad, lamina lobed for  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully developed, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 6.5 mm. long, 8.5 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 4 mm. long, 3 mm. broad.

*Mature seeds* armadillo.

**A.18.** Overcombe Beach, Weymouth, Dorset, 1926.

*Habit* semi-prostrate to suberect, stems up to 3.5 dm. long; much anthocyanin in stems but not in leaves.

*Leaves* linear to linear-lanceolate, acute, 2.1 cm. long, 4 mm. broad, with few scattered very short cilia, somewhat fleshy, green glaucous.

*Inflorescence* 3- to 7-flowered, bracts ciliate.

*Calyx* broadly ellipsoid narrowed above and below the middle, obovoid-ellipsoid in fruit.

*Corolla* with the petals and segments contiguous or slightly overlapping; diameter 2.6 cm. Petals 2.4 cm. long, 1.5 cm. broad, lamina divided  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androecium* fully developed, flowers hermaphrodite.

*Gynaeceum* with purplish stigmata and pink immature seeds.

*Ripe capsules* broadly ovoid, slightly contracted above, without the teeth 6.5 mm. long, 7.5 mm. broad, mouth 4 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3 mm. long, 2 mm. broad.

*Mature seeds* armadillo.

**A.19. Overcombe Beach, Weymouth, Dorset, 1926.**

*Habit* semi-prostrate, stems up to 3 dm. long; much anthocyanin in stems but not in leaves.

*Leaves* linear to linear-lanceolate, acute, 2.4 cm. long, 4 mm. broad, cilia few and scattered, somewhat fleshy, green glaucous.

*Inflorescence* 3- to 7-flowered, bracts without cilia.

*Calyx* broadly ellipsoid narrowed above and below the middle, obovoid-ellipsoid in fruit.

*Corolla* petals and segments contiguous to slightly overlapping; diameter 2.4 cm. Petals 2.4 cm. long, 1.2 cm. broad, lamina divided  $\frac{3}{4}$  its length, scales well developed, no anthocyanin blotch above or below.

*Androeceum* fully developed, flowers hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 4.5 mm. in diameter; teeth each an isosceles triangle, 3.5 mm. long, 2 mm. broad at the base, strongly reflexed; carpophore 3 mm. long, 2.5 mm. broad.

*Mature seeds* armadillo.

**A.20. Porlock, Somerset, 1926.**

*Habit* prostrate, stems up to 2.5 dm. long; whole plant yellowish green and without anthocyanin.

*Leaves* linear to narrowly linear-lanceolate, 1.7 cm. long, 3 mm. broad, with few scattered cilia, somewhat fleshy, yellowish green.

*Inflorescence* of 1 to 7 flowers, bracts glabrous.

*Calyx* ellipsoid in flower and fruit.

*Corolla* with the petals and segments scarcely contiguous; diameter 2.8 cm. Petals 2.4 cm. long, 1.2 cm. broad, lamina divided  $\frac{3}{4}$  its length, scales not well developed, no anthocyanin blotch above or below.

*Androeceum* functional or vestigial, in 1927 some flowers female some hermaphrodite.

*Gynaeceum* with white stigmata and pink immature seeds.

*Ripe capsules* obloid, without the teeth 6 mm. long, 7 mm. broad, mouth 3.5 mm. in diameter; teeth each an isosceles triangle, 3 mm. long, 1.5 mm. broad, strongly reflexed; carpophore 4 mm. long, 1.5 mm. broad.

*Mature seeds* armadillo.

**Plants grown from natural seed.**

In order to obtain some definite data as to the amount of intra-specific hybridization and recombination of characters in nature, seed was collected from wild plants at the time they were transplanted as stock-plants in 1926. This seed was sown and the plants raised were analysed on August 6th, 1928, *i.e.* when the plants were in the middle of their second year's growth, with the following results.

FROM A.3. 6 plants raised. 3 in habit and leaves as seed-parent, 3 as stock-plant A.6. *Calyx* of 4 cylindric, of 2 broadly



ellipsoid. *Corolla* of 2 with petals and segments both contiguous, of 3 with petals and segments not overlapping or contiguous, of one with petals and segments both overlapping, all with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaeceum* 3 with white stigmata, one with purplish; all with immature seeds pink. *Mature seeds* of 4 armadillo, of 2 weak armadillo.

FROM A.4. 5 plants raised. 4 in habit and leaves as seed-parent, one somewhat paler. *Calyx* of 2 cylindric, of 2 broadly ellipsoid. *Corolla* of 3 with petals and segments not overlapping, of 2 (including that of the paler plant) with petals overlapping and segments not overlapping, 3 with anthocyanin blotch below only, 2 (including that of the paler plant) with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaeceum* 4 with white stigmata, one with purplish; all with pink immature seeds. *Mature seeds* of 4 armadillo, of one weak armadillo.

FROM A.6. 2 plants raised. One in habit and leaves as seed-parent, 1 as stock-plant A.3. *Calyx* of both broadly ellipsoid. *Corolla* of both with petals slightly overlapping and segments not overlapping, both with anthocyanin blotch above and below. *Androecium* in both fully functional, flowers hermaphrodite. *Gynaeceum* of both with purplish stigmata and pink immature seeds. *Mature seeds* of 1 armadillo, of the other tubercled.

FROM A.7. 15 plants raised. All in habit and leaves as seed-parent, except that 13 differed in colour of stems and of calyx. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all plants functional in some flowers, but 3 plants also with female flowers. *Gynaeceum* of all with white stigmata, 13 with pink immature seeds and 2 with white immature seeds. *Mature seeds* of all armadillo.

FROM A.10. 14 plants raised. All in habit and leaves as seed-parent. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all plants but one functional in all flowers, but one plant also with female flowers. *Gynaeceum* of 12 with white stigmata, of 2 with purplish stigmata, immature seeds of all pink. *Mature seeds* of all armadillo.

FROM A.12. 32 plants raised. All in habit and leaves as seed-parent, except that 23 differed in colour of stems and calyx. *Corolla* of none with divergent petals and segments, none with anthocyanin blotch. *Androecium* in all functional in some flowers, but 4 plants also with female flowers. *Gynaeceum* of 26 with white stigmata, of 6 with purplish stigmata, immature seeds of 9 white, of 23 pink. *Mature seeds* of all armadillo.

FROM A.14. 26 plants raised. All in habit and leaves as seed-parent. *Corolla* of 4 with petals not contiguous, of 22 with petals more or less contiguous, of none with anthocyanin blotch. *Androecium* in all functional in some flowers, but 4 plants also with

female flowers. *Gynaecium* of all with purplish stigmata and pink immature seeds. *Mature seeds* of 24 armadillo, of 1 tubercled.

FROM A.15. 3 plants raised. All in habit and leaves as seed-parent. *Calyx* of all cylindric. *Corolla* in all with petals overlapping and segments contiguous, and with anthocyanin blotch above and below. *Androecium* in all fully functional, flowers hermaphrodite. *Gynaecium* in all with white stigmata and pink immature seeds. *Capsules* of 2 obloid, of 1 broadly ovoid. *Mature seeds* of 1 armadillo, of 2 from weak armadillo to tubercled.

*Note.* In plants raised from A.7, A.10, A.12, and A.14 there was some degree of fluctuation in the breadth and colour of the foliage and in the diameter of the flowers.

While many of the differences indicated very probably arose originally as mutations, the stability of characters in generations resulting from controlled pollinations shows that it is most improbable that the differences from the seed-parents in the above samples arose immediately as mutations. These differences in samples of wild seed from one seed-parent indicate, in conjunction with all our other work, that there is a considerable amount of intra-specific crossing in nature. In this way various character-combinations can arise—by aggregation and by segregation of genes.

### Variations in the characters of *S. maritima*.

It has become increasingly evident in the course of our work on *Silene maritima* and *S. vulgaris* that one of the lines of research most likely to throw light on the problems we are investigating is the study of characters one by one. Though analysis must here precede synthesis we do not at present commit ourselves to any conception of "unit characters" and, indeed, there are many characters we have not yet studied genetically, and none on which our researches are complete. Moreover, we wish to make it quite clear that for the moment we are not disputing that "the whole is not a mechanical aggregate indifferent to and without influence on its parts" (Smuts, *Holism and Evolution*, 218, London, 1927).

**Roots.** We have so far made only casual observations on the root-system of this species. The primary root-system of the seedling quickly penetrates the soil and branches tend to descend at a very acute angle. The mature main roots penetrate at least several feet in loose shingle. From the upper portions of the root-stock numerous buds arise. Root-stocks largely deprived of their main roots and with the aerial parts well cut back transplant easily and successfully. We have found no essential differences between the roots of *S. maritima* and *S. vulgaris* but hope to make further observations on the range of development of this organ in the two species. For a description of the root system in *S. vulgaris* as it grows on the English Chalk see the *Journal of Ecology*, xv. 109 (1927).

**STEMS.** The main stems are prostrate or procumbent. The ends and lateral shoots may be more or less ascending or erect.

When growing on cliff slopes the stems tend to become long trailing but when growing amongst other herbaceous or shrubby vegetation they become ascending, attenuated, and pseudo-erect; as we have observed, for example, near Abbotsbury and near Dawlish. The length of the stems, consequently the diameter of the plant, varies considerably with age and habitat. Important habitat factors are competition with plants of the same species and with general vegetation. We have so far no reason for postulating the existence of genetical factors modifying length of stem. Our measurements for length of single stems range from 1.8 dm. to 3.4 dm. A mature plant on the Chesil Beach had a diameter of 13 dm. The terete, solid or slightly hollow internodes at about the middle of mature stems average 2.3 cm. long and 1.5 mm. in diameter. The solid nodes average 2 mm. in diameter. Special attention should be called to the group of narrow-leaved plants found at the Portland end of the Chesil Beach. Their stems are decidedly more slender (diameter of internodes 1-1.5 mm., of nodes 1.5-2 mm.) and their internodes on an average longer (up to 5 cm. long) than is usual in wild populations. Although the stems are closely adpressed to the ground we have never found adventitious roots arising at the nodes either in nature or in cultivation. We have never seen puberulous or pubescent plants of *S. maritima*. The nodes, internodes, and leaves are always quite glabrous, except for a fluctuating amount of ciliation at the margins of the leaves and bracts. A considerable range occurs in the amount of anthocyanin present in the vegetative parts. Plants occur absolutely devoid of purple colouration, both in the vegetative and floral parts, while the other extreme is shown by plants whose green chlorophyll is masked by purple. Between these two extremes all grades occur. Both genetical and environmental factors are involved. The extremes have so far bred true in our experiments. On the other hand low temperatures increase for a time the amount of anthocyanin in families normally with a small amount.

*The "barren shoots" in Silene maritima.* It is generally stated that an important distinguishing feature between *S. vulgaris* and *S. maritima* is the absence of barren shoots in the former and their presence in the latter. Our extensive work of the past few years on a great range of living plants at all seasons of the year has made it evident that this statement needs further analysis. While it is true that the majority of individuals of *S. maritima*, at least throughout the growing season, show numerous non-flowering shoots in which flower buds cannot be distinguished, and the majority of individuals of *S. vulgaris* at the same stages of development have no shoots without flowers or flower-buds, the characters do not give an absolute distinction between the two species.

If the phrase "barren shoots" or "barren stems" is used it is important to remember that it merely signifies shoots without flowers, obvious flower-buds, or flower remnants at the time of

description. The phrase should not imply that the shoot is always barren, still less that it is constitutionally incapable of producing flowers. Indeed, we conclude from our observations and experiments that in both species all shoots are potential flower producers ; whether at a given time a shoot is or is not producing flowers depends on physiological and environmental factors, especially upon the phase of development of the individual plant and upon the season of the year.

The following are some of our recorded data on which these conclusions are reached :—

*S. maritima.*

1. Stock-plants of Transplants. Subsidiary plants at Kew. Collected and examined\* 18.10.28.

The majority of the apparently barren shoots showed no trace of flowers or flower-buds. A few had buds at different stages of development.

2. Hurst Castle plants growing at Kew. Collected and examined 18.10.28.

The majority of the apparently barren shoots showed no traces of flowers or flower-buds. A few had buds at different stages of development.

3. Stock-plant 23, Dawlish. Growing at Potterne, collected 25.8.28.

All the apparently barren shoots examined had young flower buds.

4. Stock-plant 3, Chesil Beach. Growing at Potterne, collected 25.8.28.

Exactly half the apparently barren shoots had flower buds hidden among the young leaves, and exactly half had no distinguishable flower buds.

5. Mountain plant No. 21.2, from Brecknock Beacon. Growing at Potterne, collected 25.8.28.

None of the apparently barren shoots examined had flower buds.

6. Stock-plant 2, Swanage. Growing at Potterne, collected 25.8.28.

All the apparently barren shoots examined had flower buds hidden in the young leaf buds.

*S. vulgaris.*

In the height of the flowering season plants of this species have usually no barren shoots and often no shoots which even appear, without dissecting, to be barren (see *K.B.* 1928, p. 15). On the other hand, plants may develop shoots without flowers or flower-buds after the main flowering season is over.

The following examples will suffice to illustrate this statement.

K.533, grown from seed collected near Brunate, N. Italy, growing at Kew on 18.10.28, showed numerous short barren shoots arising from the lower parts of the stems, and examination failed to

\*All examinations were made with the dissecting microscope to x 20 magnification.

reveal any traces of flower buds in these shoots. The same statement holds for K.454 grown at Kew from seeds collected above the Rila Monastery, Rodopes, Bulgaria, and for K.523 grown at Kew from seeds collected on the hills south of Varna, E. Bulgaria. More important still, the majority of the 25 subsidiary plants of the Transplant Experiments at Kew (Nos. 101-125) also showed barren shoots, due to secondary growth after flowering (18.10.28), without flowers or flower buds.

In general the flowering period of *S. maritima* is longer than the flowering period of *S. vulgaris*. The former flowers earlier in the spring and later in the autumn than the latter. The statement holds both for the majority of individual plants and for populations, though there are isolated exceptions. *S. maritima* has usually a much more spreading habit than *S. vulgaris*, due to the more prostrate stems and the greater production of lateral shoots. Some of these last elongate and branch to continue the main vegetative body, others quickly produce flowers, and still others form the "barren shoots" which may elongate or produce flowers as external conditions direct, or as food is available. Many buds and shoots even in *S. maritima* are also borne on the root-stock at varying depths. Indeed in the winter of 1927-28 at Potterne *S. maritima* behaved as a hemicryptophyte, while at Kew it was a combination of chamaephyte and hemicryptophyte. The same was true of *S. vulgaris* which, however, is much more of a hemicryptophyte than it is a die-back chamaephyte, especially in nature. Exactly the same was true for the winter 1928-29 till the severe frosts of February and March, when all the aerial parts were killed in both species at both localities, the plants surviving as pure hemicryptophytes.

Most of the *S. maritima* stock plants, *i.e.*, individuals transplanted from the wild, both at Kew and at Potterne, retain their full complement of shoots and leaves much longer than in *S. vulgaris*. A noteworthy exception is our stock plant 5 from the Portland end of the Chesil Beach. This is a narrow-leaved plant, with much anthocyanin in all its organs, whose aerial parts by the beginning of December, 1928, had completely died. Forty-five first-year plants grown from seeds obtained by controlled selfings of this individual and sown in the spring had also completely died down, or nearly so, by the same date.

**LEAVES. General.** Although the leaves on an individual plant show a large amount of fluctuation, the general leaf shape of a plant is a scorable character. Although we do not yet know the limits of plasticity of gene expressions or the degree of gene interaction for leaf shape and size, we know that genes are involved. In our measurements we give the size of average well developed leaves, unless we state to the contrary.

**Shape.** A central outline shape is lanceolate. In one direction variation is towards linear, in another towards ovate. In both directions the broadest portion may be shifted from below the middle

to above or to the middle. The most remarkable wild population we have so far met with is that growing at the Portland end of the Chesil Beach on the landward side. In these plants the leaf-shape is linear or some slight modification of linear. In all leaf shapes the apex is generally acute, but is sometimes slightly obtuse. There is a slight apiculus and sometimes the blade is "pinched in" just below the apex. The lower leaves are narrowed to the base, the upper are slightly amplexicaul.

*Size.* The length of average well developed leaves ranges in different plants from 1.2-2.7 cm., the breadth from 2 to 10 mm. We propose to term leaves less than 2 cm. in length "short," and those 2 cm. or more in length "long"; those less than 5 mm. in breadth are "narrow" and those 5 mm. or more "broad."

*Margin.* A narrow membranous margin surrounds the leaf. It often runs out into short distinct cilia, but this is a fluctuating character varying in different leaves on the same plant.

*Texture.* The leaf texture is constantly more succulent than in *S. vulgaris* relative to the superficial area of the leaf. We hope to treat this subject more fully after the results of the anatomical examination of our material are available.

*Colour.* The colour of the foliage shows a great range in wild populations. Anthocyanin content is dealt with under the heading of stems.

**INFLORESCENCE.** The flowers are erect and number from 1 to 7 on each inflorescence; there are usually not more than 3. We regard the few erect flowers as a specific character. The lower bracts are herbaceous, the upper scarious. On the whole the bracts are greener than in *S. vulgaris*. They may be quite glabrous or have marginal cilia.

**CALYX.** Both in the flowering and in the fruiting conditions there is a considerable range in calyx shape. The commonest type is the broadly ellipsoid. Contrasting with this is the narrow cylindric type. In the fruit the calyx naturally enlarges and there is a tendency for the broadest parts to be above the middle. In general we have been able to score calyces as broad or narrow—see figures in the text.

**COROLLA.** The variations in petal shape in this species have been studied by Dr. E. J. Salisbury.\* We have seen in the wild all the types described by him, and are now growing specimens for genetical investigation. Here we only record observations and make tentative suggestions with regard to a number of characters.

*Petal length.* This ranges from 2.0 to 2.8 cm., and we propose to term petals measuring 2.4 cm. and below "short" and petals measuring 2.5 cm. and over "long."

*Petal breadth.* This ranges from 1.9 to 0.6 cm., and we propose to term petals measuring 1.4 cm. and over "broad," and those 1.3 cm. and below "narrow."

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\*New Phytologist, xi. 7 (1912).

*Petal lobing.* Normally the blade of each petal is bilobed for  $\frac{3}{4}$  of its length and has two well-developed coronal scales at the base. We have occasionally seen plants with at least some petals with from 1 to 4 extra lateral lobes. Plants with this character are termed by Salisbury *forma lobata*, but we do not at present know the degree of stability of this character. Both the normal two lobes and the petals may be divergent, contiguous, or overlapping. For the present we consider the lobes and petals separately for these characters, whose factorial inheritance we have not yet studied.

*Anthocyanin blotch.* In several localities, especially on the Chesil Beach, we have found plants with a blotch of anthocyanin (colour, Ridgeway, Plate xi. "Rood's Violet") at the base of the blades of the petals. The blotch, which varies in size, is sometimes limited to the lower surface but often appears on the upper as well. Rarely, at the end of the flowering season the colour is diffused through the whole petal.

ANDROECIUM (sex). In the wild populations we have studied, the majority of the plants were hermaphrodite. Female plants, however, occur sporadically. Not infrequently hermaphrodite and female flowers may be found on the same individual. In our first paper we referred to the peculiar behaviour of stock-plant A.2, essentially a female, and we are continuing to keep it under observation.

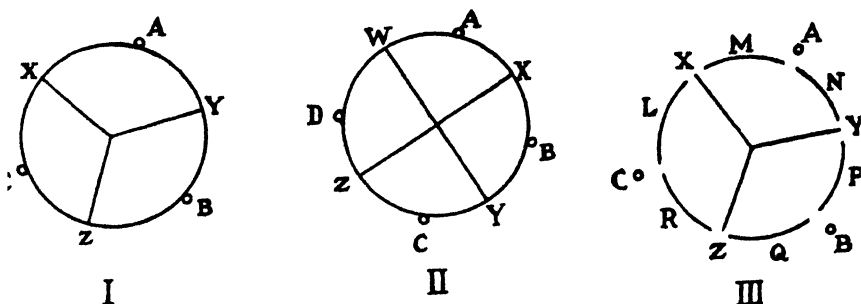
GYNAECEUM. *Stigmata colour.* Plants with purplish and others with colourless stigmata occur in the wild. At present we have nothing to add to the data of this character published in our first paper.

*Colour of immature seeds.* In *S. maritima* the majority of the plants have pink immature seeds. Plants with colourless immature seeds do, however, occur, and in one group examined on the Chesil Beach 25 plants had colourless immature seeds. Apart from this one group and two or three scattered individuals, all the many hundreds of *S. maritima* ovaries examined on the Chesil Beach had pink immature seeds. At Dawlish, S. Devon, only one plant was found with white immature seeds out of about 100 plants examined. At Porlock, Somerset, about another 100 plants were examined for this character and all had pink immature seeds.

FRUITS. For shape of capsule we have scored the items into two classes: broadly ovoid and obloid. The former are the more elongated and are slightly narrowed in the upper part. The latter are always broader than long, with large mouths relative to the size of the capsules, and are flattened, with a "squat" appearance. Text figures of the two types are given. Usually there is no difficulty in scoring, but occasionally we have obtained intermediates or a range in one individual plant (as in A.8).

The carpophore varies in length from 3 to 4.5 mm., and in breadth from 1.5 to 3 mm.

The normal capsule is composed of three syncarpous carpels each represented by one loculus dehiscing by two apical teeth. Flowers with gynaecea of 4 or 5 carpels occasionally occur, and these have 4 or 5 styles and yield carpels with 4 or 5 loculi and 8 or 10 teeth. Irregularities are occasionally found and in order to understand the range of these the following analyses were made. Since we felt it desirable to complete our studies of the gross morphological structure of the carpel the second set of data is fully recorded here.



*Silene maritima*. Diagrams of capsules.

I, Diagram of normal 3-locular capsule; II, Diagram of 4-locular capsule; III, Diagram of 3-locular capsule showing normal position of six teeth.

A.B.C.D. indicate position of the styles; W.X.Y.Z. indicate the position of septa; L.M.N.P.Q.R. indicate capsular teeth.

#### *Flowers with more than three carpels.*

I. Flowers on subsidiary plants of the Transplant experiments at Kew, *i.e.*, grown from seed, selfed under full control, of stock-plant 1. Each flower was tagged with a number indicating the number of styles. The mature capsules were examined on 27.9.28.

	Styles.	Teeth.	Loculi.
1	4	8	4
2	4	8	4
3	5	10	5
4	4	8	4
5	4	8	4
6	5	7	5

In capsule No. 6 there were 4 single and 3 double teeth. Each of the latter was opposite a septum.

II. Flowers marked at Potterne as having four or five styles each and then allowed to set seed naturally, that is they were not caged or bagged or artificially pollinated. The whole of this research was carried out in the latter part of the summer of 1928.

In the analytical account given below the identity number of the plant is given, the number of styles in each flower with more than 3, the number of capsules obtained and examined, the number of loculi in each capsule, and the number of teeth with the relative position of the septa and the cohesion of the teeth. A figure 1 indicates a



single capsular tooth, a bracket indicates fusion of teeth, those teeth within a pair of brackets not having separated, and a full stop indicates a septum.

*maritima* stock-plant 10. 1 capsule from a flower with 4 styles.  
4 loculi. teeth II.I(I.I)(I.I)I.

*maritima* stock-plant 11. 4 capsules, each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.II.II.
- b. 4 loculi. teeth II.II.(II).(II).\*
- c. 4 loculi. teeth II.II.II.II.
- d. 4 loculi. teeth II.(II).II.(II).

*maritima* stock-plant 14. 1 capsule from a flower with 4 styles.  
4 loculi. teeth II.II.I(I.I)I.

*maritima* stock-plant 17. 3 capsules, each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.II.(II).
- b. 4 loculi. teeth II.II.II.II.
- c. 4 loculi. teeth II.II.I(I.I)I.

*maritima* stock-plant 20. 1 capsule from a flower with 4 styles.  
4 loculi. teeth I(I.I)(I.I)\*(I.I)(I.

*maritima* stock-plant 21.2. 2 capsules, each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.I(I.I)I.
- b. 4 loculi. teeth II.I(I.II)\*.II.

N.12 2 capsules, each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.(II)†.(II)†.
- b. 4 loculi. teeth II.(II).(II).(II). This capsule was very young and the teeth would probably have split into 8 singles had the fruit been left on the plant to ripen.

N. 15. 10 capsules, each from a flower with 4 styles.

- a. 4 loculi. teeth II.III.I(I.I)I. One extra tooth, due to injury of the ovary apex, probably from an insect puncture.
- b. 4 loculi. teeth II.(II).II.II.
- c. 4 loculi. teeth II.IIII.II.II. Two extra teeth in one loculus. There was no sign of injury and no sign of a fifth septum.
- d. 4 loculi. teeth II.II.II.II.
- e. 4 loculi. teeth II.II.II.II.
- f. 4 loculi. teeth I(I.I)I.(II).II.
- g. 4 loculi. teeth II.I(I.I)I.II.
- h. 4 loculi. teeth II.II.II.II.
- i. 4 loculi. teeth II.II.II.II.
- j. 4 loculi. teeth II.II.II.II.

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\*Partly united. †With style remnants at apices.

- N.15. 1 capsule from a flower with 5 styles.  
5 loculi. teeth II.(II).I(I.I)(I.II). This capsule was the largest seen and was full of good seeds.
- N.16. 26 capsules each from a flower with 4 styles.
- a. 4 loculi. teeth II.II.II.II.
  - b. 4 loculi. teeth I(I.I)(I.I)(I.I)(I.
  - c. 4 loculi. teeth I(I.I)(I.I)I.II.
  - d. 4 loculi. teeth II.(II).II.II.
  - e. 4 loculi. teeth I(I.I)(I.I)I.II.
  - f. 4 loculi. teeth II.(II)\*.II.II.
  - g. 4 loculi. teeth II.I(I.I)I.II.
  - h. 4 loculi. teeth II.I(I.I)I.II.
  - i. 4 loculi. teeth II.(II).(II).II.
  - j. 4 loculi. teeth II.II.II.II.
  - k. 4 loculi. teeth II.II.II.IO†.
  - l. 4 loculi. teeth II.(II).II.II.
  - m. 4 loculi. teeth I(I.I)I.I(I.I)I.
  - n. 4 loculi. teeth II.II.II.II.
  - o. 4 loculi. teeth II.I(I.I)I.(II).
  - p. 4 loculi. teeth II.II.I(I.I)I.
  - q. 4 loculi. teeth I(I.I)(I.I)I.II.
  - r. 4 loculi. teeth I.(I.I)I.II.II.
  - s. 4 loculi. teeth (II).(II).(II).(II). a poorly developed capsule.
  - t. 4 loculi. teeth (II).(II).(II).(II).
  - u. 4 loculi. teeth II.II.II.III. one extra tooth.
  - v. 4 loculi. teeth II.II.II.II.
  - w. 4 loculi. teeth (II).(II).(II).II.
  - x. 3 loculi. teeth II.I(II)(I.I)II. one septum suppressed and represented only by a line down the wall of the ovary. One extra tooth present.
  - y. 3 loculi. teeth II.III.III.
  - z. 3 loculi. teeth II.II.II:I. one abnormal septum and one tooth perhaps double. The abnormal structure probably due to an early injury to the ovary.

N.16. 2 capsules each from a flower with 5 styles.

- a. 5 loculi. teeth (II.I)†(I.I)(I.I)(I.I)I.
- b. 5 loculi. teeth (II).(II.I)(I.I)I.(II).

N.21. 5 capsules each from a flower with 4 styles.

- a. 4 loculi. teeth II.II.II.II.
- b. 4 loculi. teeth II.II.II.II.
- c. 4 loculi. teeth II.I(I.I)I.II.
- d. 4 loculi. teeth II.I(I.I)(I.I)I.
- e. 4 loculi. teeth II.I(I.I)(I.I)I.

\*Style remnant attached. †Destroyed by insect.

‡Style remains on this compound tooth.

N.22. 2 capsules each from a flower with 4 styles.

a. 5 loculi. teeth I(I.I)(I.I)(I.I)I.

b. 4 loculi. teeth II.I(I.I)(I.I)I.

N.25. 2 capsules each from a flower with 5 styles.

a. 5 loculi. teeth II.I(I.I)(I.I)(I.I)I

b. 5 loculi. teeth II.II.II.II.II.

A total of sixty-five capsules is recorded in the above analyses.

**MATURE SEEDS.** In our first paper we scored mature seeds into two classes on the basis of testa character—armadillo and tubercled. Further work has proved that this classification is not fine enough, and we now work with four classes—armadillo, weak armadillo, tubercled, and strongly tubercled. These are difficult to define in words but the figures indicate our standards.

Seed counts in wild populations have yielded the following results:—

				weak armadillo.	weak armadillo.	tubercled.	strongly tubercled
Chesil Beach, Portland end	...	62	3	5	—	—	—
Chesil Beach, general	...	26	—	—	—	—	—
Overcombe	... ..	31	—	—	—	—	—
Porlock	... ..	1	—	—	—	—	—
Hurst Castle	... ..	10	7	—	—	—	—
Pembroke	... ..	2	—	—	—	—	10
Dawlish (Lea Mount)	...	—	—	—	—	—	28
Dawlish (between the town and the Warren)	... ..	—	—	—	—	—	12
Teignmouth (Smugglers' Lane)	...	—	—	—	—	—	5
Shaldon	... ..	—	—	—	2	—	9
Paignton	... ..	3	—	—	—	—	—
Foula	... ..	—	—	—	1	—	—
Sark	... ..	—	—	—	—	—	2
Mainland, Orkney	... ..	1	—	—	—	—	—
Par Sands, Cornwall	... ..	1	—	—	1	—	—

In addition to the above, armadillo or weak armadillo seeds are known from Poole in Dorset, Eastbourne in Sussex, Heacham and Blakeney in Norfolk, from Iceland, from Sweden and from various localities in France. Tubercled to strongly tubercled seeds are at Kew from Aberdeen, Brean Down in Somerset, and various French localities.

#### *Numbers of seeds per capsule.*

With the double object of determining the numbers of seeds produced in single capsules and the proportion of good seeds to bad, a number of counts was made. The capsules were collected just before they opened and each record represents the seeds from one capsule.

*Counts of seeds from single capsules.*

Fr from stock-plant 1 selfed (strongly tubercled).

61 good 41 bad : 64 good 53 bad : 67 good 73 bad : 44 good  
59 bad : 84 good 25 bad.

Range of total seeds from 140 to 102.

Highest number of good seeds 84.

Lowest number of good seeds 44.

Highest number of bad seeds 73.

Lowest number of bad seeds 25.

Average number of good seeds per capsule 64.

Average number of bad seeds per capsule 50.

Stock-plant 2.

22 good 99 bad : 30 good 65 bad : 35 good 111 bad : 35 good  
96 bad : 36 good 86 bad : 38 good 80 bad.

Range of total seeds from 146 to 95.

Highest number of good seeds 38.

Lowest number of good seeds 22.

Highest number of bad seeds 111.

Lowest number of bad seeds 65.

Average number of good seeds per capsule 33.

Average number of bad seeds per capsule 89.

Stock-plant 3.

28 good 21 bad : 35 good 31 bad : 32 good 60 bad : 28 good  
30 bad : 27 good 63 bad.

Range of total seeds from 92 to 49.

Highest number of good seeds 35.

Lowest number of good seeds 27.

Highest number of bad seeds 63.

Lowest number of bad seeds 21.

Average number of good seeds per capsule 30.

Average number of bad seeds per capsule 41.

Stock-plant 5.

30 good 28 bad : 21 good 37 bad : 35 good 22 bad : 25 good  
35 bad : 27 good 25 bad : 34 good 28 bad.

Range of total seeds from 62 to 52.

Highest number of good seeds 35.

Lowest number of good seeds 21.

Highest number of bad seeds 37.

Lowest number of bad seeds 22.

Average number of good seeds per capsule 29.

Average number of bad seeds per capsule 29.

Stock-plant 6.

30 good 19 bad : 36 good 17 bad : 26 good 11 bad : 36 good  
9 bad : 26 good 19 bad : 29 good 17 bad.

Range of total seeds from 53 to 37.

Highest number of good seeds 36.

Lowest number of good seeds 26.

Highest number of bad seeds 19.

Lowest number of bad seeds 9.  
Average number of good seeds per capsule 30.  
Average number of bad seeds per capsule 15.

Stock-plant 7.

58 good 16 bad : 93 good 11 bad : 84 good 18 bad : 68 good  
21 bad : 124 good 13 bad : 111 good 17 bad.  
Range of total seeds from 137 to 74.  
Highest number of good seeds 124.  
Lowest number of good seeds 58.  
Highest number of bad seeds 21.  
Lowest number of bad seeds 11.  
Average number of good seeds per capsule 90.  
Average number of bad seeds per capsule 16.

Stock-plant 13.

36 good 38 bad : 34 good 35 bad : 39 good 63 bad : 31 good  
46 bad : 34 good 84 bad : 37 good 28 bad.  
(The numbers for the first two and the last are not very  
reliable as the capsules were too young to distinguish good from  
bad seeds with certainty.)  
Range of total seeds from 118 to 65.  
Highest number of good seeds 39.  
Lowest number of good seeds 31.  
Highest number of bad seeds 84.  
Lowest number of bad seeds 28.  
Average number of good seeds per capsule 35.  
Average number of bad seeds per capsule 49.

Stock-plant 17.

75 good 50 bad : 55 good 39 bad : 60 good 36 bad : 75 good  
37 bad : 59 good 66 bad : 55 good 72 bad.  
Range of total seeds from 127 to 94.  
Highest number of good seeds 75.  
Lowest number of good seeds 55.  
Highest number of bad seeds 72.  
Lowest number of bad seeds 36.  
Average number of good seeds per capsule 63.  
Average number of bad seeds per capsule 50.

Stock-plant 20.

29 good 58 bad : 37 good 44 bad : 40 good 29 bad : 38 good  
56 bad : 42 good 34 bad : 31 good 37 bad.  
Range of total seeds from 94 to 68.  
Highest number of good seeds 42.  
Lowest number of good seeds 29.  
Highest number of bad seeds 58.  
Lowest number of bad seeds 29.  
Average number of good seeds per capsule 36.  
Average number of bad seeds per capsule 43.

Stock-plant 23 (strongly tubercled).

110 good 23 bad : 101 good 20 bad : 68 good 54 bad : 114 good  
23 bad : 89 good 18 bad : 138 good 44 bad.

Range of total seeds from 182 to 107.

Highest number of good seeds 138.

Lowest number of good seeds 68.

Highest number of bad seeds 54.

Lowest number of bad seeds 18.

Average number of good seeds per capsule 103.

Average number of bad seeds per capsule 30.

For the whole of the collections examined :

Number of capsules 58 from 10 plants.

Range of total seeds from 182 to 37.

Highest number of good seeds 138.

Lowest number of good seeds 21.

Highest number of bad seeds 84.

Lowest number of bad seeds 9.

Average number of good seeds per capsule 51.

Average number of bad seeds per capsule 41.

*Note* : High numbers in plants, 7, 17, 23.

Low numbers in plants, 3, 5, 6, 20.

High numbers of bad seeds in plant 2.

There is some evidence that the numbers of good and bad seeds per capsule is an inherent character of the individual plant. The evidence is not entirely satisfactory and by itself cannot lead to any further conclusions.

The "bad" seeds examined under the compound microscope showed varying degrees of development. In all those examined it was possible to distinguish the markings on the light brown testa. By far the greater number were translucent and obviously devoid of embryo and endosperm. It appears that all the ovules make some attempt to develop into seeds and that the partial formation of a testa is carried out even if the seeds do not mature.

The recognition of the large number of ovules which do not produce viable seeds as indicated by these studies is of considerable importance, since any kind of selective fertilization, or the presence of lethal or sublethal factors, would probably prevent expected ratios being obtained in controlled crosses. Tests of germination capacity of "good" seeds are now in progress.

Tests and recounts indicated that the figures given are for the "good" seeds accurate to about 2 per cent., for the "bad" seeds to about 5 per cent. Causes of error are the shooting away of seeds as the capsules are opened, breaking of "bad" seeds (which are often flat thin plates), covering of "bad" seeds when they adhere to "good" ones or to one another, and the difficulties of distinguishing between "good" and "bad" seeds. The last cause of error is most important when the capsule was gathered before the seeds were quite mature.

### Intra-specific variation.

In this paper we are only incidentally concerned with inter-specific differences. So far as lowland plants in this country are concerned there is no practical difficulty in maintaining *S. maritima* and *S. vulgaris* as distinct species, although in a future paper we shall indicate how all their morphological characters overlap. Moreover, there is a remarkable degree of parallelism between the intra-specific variation of the two species.

We have already indicated a considerable number of variable characters within *S. maritima*. These characters appear in numerous combinations. Indeed, at present we know of no limits to the possible combinations of characters. It would be a useless and confusing result were we to give names to all the character combinations we have found. The same problem, in an even more intense form, has arisen in *S. vulgaris* and has, indeed, been recognized in that species. At least two methods of intra-specific nomenclature have been proposed. Ascherson and Graebner [*Synopsis der Mitteleur. Flora* v. 2. 64 (1920)] have various subordinate ranks to which Latin trivial names are given. The subordination has been based entirely on morphological conceptions, derived mainly from dried material, and is therefore largely subjective. The system also constantly breaks down when applied to wild populations and is not sufficiently elastic to be improved without basic alteration. Negodi [*Archivo Botanico* iv. 40, 138, 217 (1928)], on the other hand, recognises the weakness of Ascherson and Graebner's method, but also allows himself to fall under the tyranny of names. He subordinates *S. maritima* and *S. vulgaris* to the rank of subspecies of one species which he terms *S. angustifolia*. Under each subspecies he then makes a large number of varieties. Even with the unwieldy number of varietal names he uses (up to the last published part, March 1929, these number 56), many character combinations already known to us are not accounted for. The character combinations ignored are taxonomically and genetically the equivalents of those to which names have been given.

Knowing that some of our botanical colleagues are finding similar difficulties in other groups of plants, we feel it is desirable to put forward tentative proposals for a new method of dealing with intra-specific variation within a polymorphic Linneon. The scheme we use here must not be in any way accepted as final. Until our genetical researches have indicated the value of all the characters found in both species it is bound to remain incomplete. Our ideal is to formulate a scheme comparable with chemical symbolism.

#### *Scheme.*

Let R=roots, S=stems, L=Leaves, I=inflorescence, K=calyx, C=corolla, A=androecium, G=gynaeceum, F=fruits, Se=seeds.

Up to the stage at which our work has arrived we need the following figure symbols for intra-specific variation in *S. maritima*.

- L.1=leaves long, *i.e.*, 2 cm. or more than 2 cm. in length.  
 2=leaves short, *i.e.*, less than 2 cm. in length.  
 3=leaves broad, *i.e.*, 5 mm. or more than 5 mm. in breadth.  
 4=leaves narrow, *i.e.*, less than 5 mm. in breadth.  
 5=leaves with much anthocyanin.  
 6=leaves with no anthocyanin.

- K.1=calyx broad in flower.  
 2=calyx narrow in flower.

- C.1=petals long, *i.e.*, 2.5 cm. or more in length.  
 2=petals short, *i.e.*, less than 2.5 cm. in length.  
 3=petals broad, *i.e.*, 1.4 cm. or more in breadth.  
 4=petals narrow, *i.e.*, less than 1.4 cm. in breadth.  
 5=petals bilobed.  
 6=petals multilobed.  
 7=petals overlapping or contiguous.  
 8=petals not overlapping or contiguous.  
 9=petal lobes overlapping or contiguous.  
 10=petal lobes not overlapping or contiguous.  
 11=anthocyanin blotch present.  
 12=anthocyanin blotch absent.

- A.1=functional stamens present (flowers hermaphrodite).  
 2=functional stamens absent (flowers female).

- G.1=stigmata purplish.  
 2=stigmata colourless (white).  
 3=immature seeds pink.  
 4=immature seeds colourless (white).

- F.1=capsules broadly ovoid.  
 2=capsules obloid.

- Se.1=mature seeds armadillo.  
 2=mature seeds weak armadillo.  
 3=mature seeds tubercled.  
 4=mature seeds strongly tubercled.

Although in the table we have not had occasion to do so, it is possible to utilize the same scheme for fluctuating characters. Thus if one has a plant in which the calyx is intermediate between broad and narrow, the shape can be represented by K.1-2 if it is exactly intermediate or verges towards the narrow standard, or by K.2-1 if it verges more towards the broad standard. If measurements are involved in the definitions of the primary figure symbols any degree of precision in recording intermediates can be obtained by the use of the decimal system.

To further illustrate the use of symbols the formulae for a number of the stock plants already described are given.

A.3.	L.1.4.5.	K.1.	C.1.3.5.7.9.11.	A.1.	G.2.3.	F.1.	Se.2.
A.4.	L.1.4.5.	K.1.	C.1.4.5.8.10.11.	A.1.	G.2.3.	F.1.	Se.1.
A.5.	L.1.4.5.	K.2.	C.1.4.5.8.9.11.	A.1.	G.1.3.	F.1.	Se.1.
A.7.	L.2.4.6.	K.1.	C.1.3.5.7.9.12.	A.1.	G.2.4.	F.2.	Se.1.
A.9.	L.1.4.5.	K.2.	C.1.4.5.7.9.11.	A.1.	G.2.3.	F.1.	Se.3.
A.14.	L.2.3.6.	K.1.	C.2.4.5.7.9.12.	A.1.	G.1.3.	F.2.	Se.1.



Identity No.	Locality.	L 1. 2. 3. 4. 5. 6.	K. 1. 2.	C. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	A. 1. 2.	G. 1. 2. 3. 4.	F. 1. 2.	Se. 1. 2. 3. 4.
1	Chesil Beach, Portland end	1. 4 5.	2.	2. 4. 5. 8. 10. 11.	1.	2. 3.	2.	1.
2		2. 4 5.	2	2. 4 5 7. 10. 11.	1.	2. 3.	2.	1.
3		1. 4 5	--	-- -- 6. 7. 10. 11.	1.	1. 3.	--	1.
4		1. 4. 5.	2	2 4 5 7 10. 11.	1.	1. 3.	2.	1.
5		2 4 5.	2	2 4 5. 7 9 11.	1.	1. 3.	2.	3.
6	" "	2. 4 5.	2	2. 4 5 7. 10. 11.	1.	2. 3.	2.	1.
7		2. 4 6	2	2 4 5 8 10. 11.	1.	2. 4. 1.	1.	
8		2. 4 5	2.	2. 4 5. 8. 10. 11.	1.	2. 3.	2.	3.
9		2. 4 5.	2	2 4. 5. 7 9 12	1.	2. 3	2	1.
24		2. -- 5	1	-- -- 5. 7 10. 11.	1	2. 3.	--	3.
10	Chesil Beach, opposite Wyke Regis	2. 4. 6	2	2. 4 5. 7. 10 12	1	2 4.	--	--
11	Chesil Beach, Abbotsbury	1. 3. 6	1	2. 3 5. 7 9. 12.	1.	2 3.	1.	1.
12		1. 3 6	1	2 4. 5. 8 9 12	1.	2. 3.	2.	1.
13		2 3. 6.	1	2. 4. 5 7 9. 12.	1.	2 3.	1.	1.
14		2. 3 6	1	1. 4 6 8 10. 12.	1.	2 3		1.
15		2 3 6	1.	2. 4. 6. 7. 9 12.	1.	2. 3.	--	--
16		-- -- 6	1	-- -- 6 7. 9 12	1.	1. 3.	--	1.
17		2. 4. 6.	1.	2. 4. 5. 8. 10. 12.	1.	2. 3.	2.	1.
19		2. 4. 6	1.	2. 4. 6. 7. 9. 12.	1.	2. 3.	2.	1.
20		2. 4. 6.	1.	1. 4. 6. 7. 9. 12.	1.	2. 3.	2.	1.
21		2. 4. 6.	2.	2. 4. 5. 7. 9. 12.	1.	2. 3.	--	1.

In the table when, for one reason or another, a character has not been scored a dash takes the place of a figure symbol.

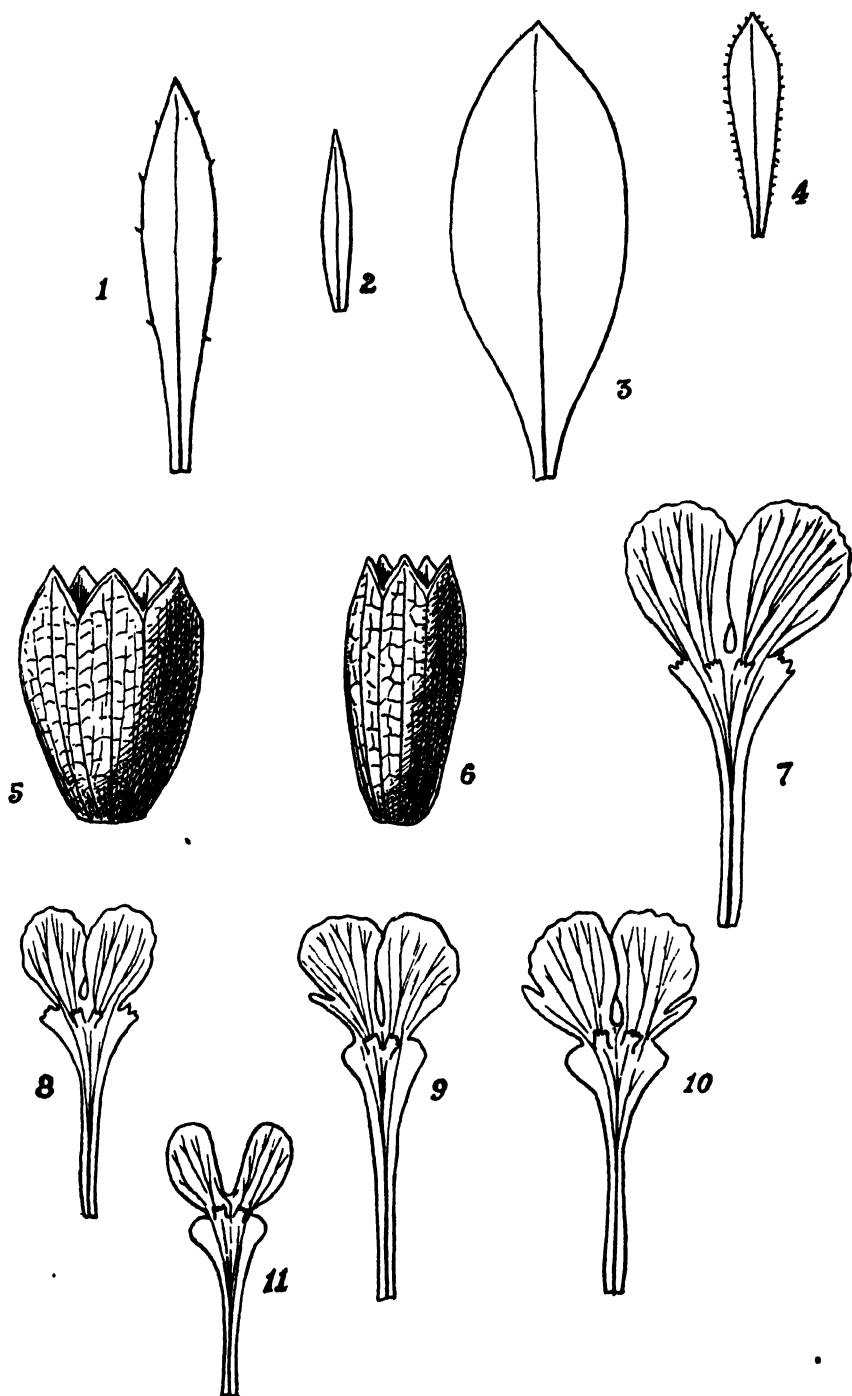
### Studies on wild populations.

#### CHESIL BEACH, DORSET.

*S. maritima* occurs discontinuously on the landward slopes along the whole beach. Towards the Portland end there is a remarkable isolated group of 1310 individuals (19.7.28) with slender habit, narrow leaves, and usually much anthocyanin. Although not uniform in all characters, as indicated by the table (Nos. 1 to 9 and 24), the plants obviously form a group distinct from the rest of the population. From the next mass of *Silenes* on the shingle this group is separated by a distance of about 800 yards and is divided into 6 unequally sized smaller patches. The total length of the group is about 300 yards and its greatest breadth, at right angles to the beach, 31 yards, reaching to within 6 yards of the edge of the shingle. Where these narrow-leaved plants occur the pebbles are whitish as contrasted with the pale yellow brown of the rest. On them the following lichens were common. *Buellia confervoides*, *B. myriocarpa* and *Rhizocarpon confervoides* (determined R. Paulson, 4.2.29). Associated with the *Silenes* in a very open community were *Geranium robertianum* and *Rosa spinosissima*. A more or less continuous narrow zone of stouter, broader-leaved, greener *Silenes* was growing along the stabilized edge of the shingle. Although the group at the Portland end could easily be cross-pollinated by insect visitors from these *Silenes* at the shingle edge or even from the group 800 yards away, we could find no trace in the group of such cross-pollination having occurred. Further, natural seed collected from these plants and sown at Potterne also gave no evidence of cross-pollination having occurred with plants outside the group.

Nearly opposite Wyke Regis another mass of plants was examined. These formed a marked contrast to the community at the Portland end of the Beach. They were growing on more stabilized shingle. All types were present except those with slender stems, very narrow leaves (relative to breadth), and much anthocyanin. Individuals with shorter and greener leaves were dominant. Plants with an anthocyanin blotch on the petals occurred but were not so numerous as at the Portland end; more than 50 per cent. of the plants examined were without it. In an area 24 yards by 8, fourteen plants with no anthocyanin in any of their parts were counted growing amongst plants with little to a medium amount of anthocyanin. They all had white immature seeds. Scattered about outside the above area 11 more were found with no anthocyanin and immature seeds white. Plants attacked by *Ustilago* were here rather prevalent.

At the Abbotsbury end of the Chesil Beach the *Silene* population was studied over about 3 miles of shingle. A small proportion of narrow leaved plants was seen. Taking the population as a whole



the plants had usually only a small amount of anthocyanin. *Ustilago* was very prevalent and traces of *Marssonina* were also seen. The *Silene* plants sometimes formed an almost closed community stabilizing the shingle. The greatest width of shingle with *Silene* plants was 80 yards, measured at right angles to the shore. Plants without an anthocyanin blotch on the petals were more frequent than those with one, and it was noticed that the plants attacked by *Ustilago* tended to develop the blotches. Some plants of *Silene* were growing amongst the bushes of *Tamarix* near the edge of the shingle and had considerably elongated their stems and increased the size of their leaves.

#### OVERCOMBE BEACH, EAST OF WEYMOUTH, DORSET.

For about half-a-mile on loose shingle *Silene* plants form a scattered very open type of vegetation. The population as a whole agrees very closely with that occurring on the Chesil Beach opposite Wyke Regis. The plants are all green, without anthocyanin, or with only a small amount, and a few were noted with reddish anthocyanin in the calyx. There were fewer with blotches on the petals than without.

#### DAWLISH, S. DEVON.

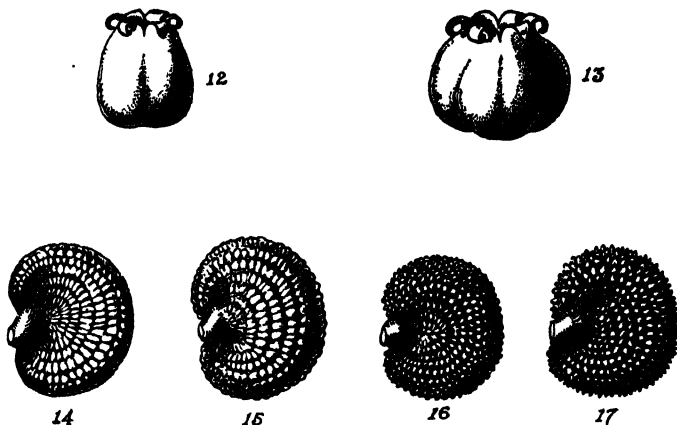
In our second paper on *Silene* we have described the occurrence of hybrids in this district and have given a general account of their distribution and of that of their parents. It will suffice to add that between Dawlish and Dawlish Warren *S. maritima* grows on the cliff and down to the railway line. A path runs along the top of the cliff and is bounded on the cliff side by rails, which are 7 yards from the edge, and on the inland side by a hedge, composed of *Ulex*, *Prunus*, *Rubus*, and *Eupteris*, 4 yards in width. 5 plants were found on the inland side of the hedge growing up into it. They had much attenuated stems and large leaves. Other plants grew on the seaward side of the hedge and amongst gorse and bracken between the rails and the cliff.

#### EXPLANATION OF FIGURES ON PAGE 172.

*Silene maritima*. Fig. 1, Leaf of plant number 1 from Chesil Beach, Portland end (stock-plant 26), long and narrow,  $\times 2$ . Fig. 2, Leaf of plant number 8 from Chesil Beach, Portland end, short and narrow,  $\times 2$ . Fig. 3, Leaf of plant number 12 from Chesil Beach, Abbotsbury end, long and broad,  $\times 2$ . Fig. 4, Leaf of plant from Kimmeridge, short and narrow, margins strongly ciliolated,  $\times 2$ . Fig. 5, Calyx from plant number 20 from Chesil Beach, Abbotsbury end, broad in flower,  $\times 2$ . Fig. 6, Calyx from plant number 21 from Chesil beach, Abbotsbury end, narrow in flower,  $\times 2$ . Fig. 7, Petal from stock-plant A. 12, as grown at Potterne, long and broad, bilobed, lobes overlapping,  $\times 2$ . Fig. 8, Petal from plant number 9 from Chesil Beach, Portland end, short and narrow, bilobed, lobes contiguous to overlapping. Fig. 9 and Fig. 10, Petals from same flower of plant number 20, Chesil Beach, Abbotsbury end, multilobed,  $\times 2$ . Fig. 11, Petal from plant on Chesil Beach, Abbotsbury end, to show divergent lobes, giving a stellate appearance to the flower,  $\times 2$ .

## SMUGGLER'S LANE, TEIGNMOUTH.

One plant of *S. maritima* was found growing on a stone wall 40 yards from the coast.



*Silene maritima*. Fig. 12, Capsule of ovoid type,  $\times 2$ . Fig. 13, Capsule of obloid type,  $\times 2$ . Fig. 14, Seed of armadillo type,  $\times 12$ . Fig. 15, Seed of weak armadillo type,  $\times 12$ . Fig. 16, Seed of tubercled type,  $\times 12$ . Fig. 17, Seed of strongly tubercled type,  $\times 12$ .

### Summary and Conclusions.

1. Descriptions are given of stock-plants, of *Silene maritima*, which have been used up to 1928 for breeding experiments. These descriptions alone indicate that a great range of characters and character-combinations occurs in nature.

2. An account is given of plants grown from samples of wild seed. It is shown that intra-specific crossing largely accounts for the numerous different character-combinations found in individuals of wild populations.

3. The characters which have been found in the species as a whole, excluding mountain plants, are considered under the following headings: roots, stems (barren shoots), leaves (general, shape, size, margin, texture, colour), inflorescence, calyx, corolla (petal length, petal breadth, petal lobing, anthocyanin blotch), androecium (sex), gynaeceum (stigmata colour, colour of immature seeds), fruits (extra carpels), mature seeds (number of seeds per capsule).

4. It is shown that there are many different characters exhibited by the different organs within the one species. Moreover these occur in numerous combinations—indeed at present we have no reason for supposing that any theoretically possible combination does not occur in nature. It would appear that whatever linkage groups exist are at times broken by crossing over.

5. The uselessness and inconvenience of attempting to name all the character-combinations (known or possible) as subspecies,

varieties, forms, etc., is commented upon. For many of the characters it is impossible to assign valid reasons for accepting one or several as having superior taxonomic value over others. For these reasons, amongst others, a tentative scheme is proposed for dealing with intra-specific variation within a polymorphic Linneon. The scheme involves the use of letters and arabic numerals and it is intended to extend its use in future papers in this series.

6. A summary account is given of the distribution of wild populations on the Chesil Beach and Overcombe Beach, in Dorset, and at Dawlish, S. Devon. Attention is called to a remarkable group of 1310 plants at the Portland end of the Chesil Beach. These form the most uniform wild population yet studied and, with few exceptions, agree in having a lax general appearance, narrow leaves, and much anthocyanin.

## XXVIII.—MISCELLANEOUS NOTES.

The Minister of Agriculture and Fisheries has appointed Mr. LEWIS STENNING to be Assistant Curator of the Royal Botanic Gardens, Kew, in succession to Mr. Taylor.

DR. VIKTOR FERDINAND BROTHERUS, who died at Helsingfors in February, 1929, in his 90th year, had long been a correspondent of Kew and had rendered valuable assistance in naming mosses. He will be best remembered for his work on the mosses in Engler & Prantl's *Pflanzenfamilien*, 1901-1909, the second edition of which appeared in 1924-25. His first paper, entitled "Nagra exkursionen omkring Ponoj" was published in 1873 in the *Botaniska Notiser*, and his last early in 1929, called "Symbolae Sinicae," dealt with the mosses collected in China by Prof. H. Handel-Mazzetti. During this interval of 56 years he issued papers on the mosses of nearly all parts of the world, and was justly regarded as the leading bryologist.

In 1872 Brotherus collected mosses in Lapland, and in 1877 and again in 1881 he visited the Caucasian Alps and distributed named sets of the mosses he collected there. He made a journey to Central Asia in 1896. His moss herbarium is said to contain 110,000 specimens.

His interest was not entirely confined to mosses, for annually from 1909 to 1917 he published a record of the opening of flowers and unfolding of leaves of plants at various stations in Finland. He was elected a Foreign Member of the Linnean Society in 1920.

C. H. W.

JOHN WILLIAM HARSHBERGER.—We regret to record the death of Professor J. W. Harshberger on the 28th of April last. For the greater part of his life he was associated with the University of Pennsylvania and had held the Chair of Botany since 1911. He visited Europe in 1923 and called at Kew on his homeward journey.

**The Lilac.**—There is no shrub, introduced or native, that is more characteristic of our villages and country gardens than the common lilac, and the love English people have for it has led them to associate

it with a particular season of the year, now generally known as "Lilac time." It would seem by the publication of this work\* that it enjoys, or is likely to enjoy, a similar popularity in America, for no genus of ornamental shrubs, other perhaps than *Rosa* and *Rhododendron*, has had devoted to it so sumptuous a volume as this on *Syringa*.

Mrs. McKelvey's work is a handsome quarto volume running to six hundred pages of letterpress and is illustrated by 171 full page plates, most of them reproductions of photographs made in the Arnold Arboretum.

It is remarkably thorough and comprehensive from historical, botanical and horticultural points of view. Mrs. McKelvey has evidently culled from every available source all the information of any interest that bears on her subject, and this, added to her own work and research, has enabled her to produce a book of great interest and distinction.

The genus *Syringa* is a well-marked one. Of cultivated plants, *Forsythia* is most nearly related to it, but this is, of course, distinguished by its yellow flowers. Mr. Alfred Rehder has furnished a key to the genus. The twenty-eight species admitted into it are conveniently and naturally grouped into two sections, viz., *Eusyringa* and *Ligustrina*, and of the former of these he makes two series, the *Villosae* and *Vulgares*. The section *Ligustrina* has a superficial resemblance to some of the privets (*Ligustrum*), but the latter are well marked by their juicy, berry-like drupes, the fruit of *Syringa* being always a dry loculicidal capsule. The genus as a whole presents no particularly embarrassing botanical problems, although authors have created some by making too many species. There has been on this account considerable confusion amongst the lilacs introduced during the present century from China, as has happened also in other genera recruited in recent times from the same country. Several plants given specific rank in as recent a publication as the *Plantae Wilsonianae* are here reduced. Amongst names that Mrs. McKelvey sinks as synonyms are *S. Sargentiana* (under *Komarowi*); *S. Wilsonii*, *S. Rehderiana*, *S. albo-rosea* and *S. Adamiana* (under *tomentella*); *S. Palabiniiana* and *S. Koehneana* (under *velutina*). We are thereby saved much trouble going from bush to bush trying to find distinctions that do not exist.

Mr. E. H. Wilson contributes a very interesting chapter on the history and distribution of the genus, and Mrs. McKelvey has obtained help on cultural matters and on diseases and pests. But the great bulk of the work is her own, and it stands as a monument to her wonderful industry. The references she has compiled from works in every civilised language must have involved enormous labour; those concerning *S. vulgaris* alone fill more than two pages.

W. J. B.

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\*The Lilac. A Monograph, by Susan Delano McKelvey. 1 vol. quarto. The Macmillan Company, New York, 1928. Pp. xvi + 581, plates 171. Price £3 15s. nett.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1929 ROYAL BOTANIC GARDENS, KEW

## XXIX.—THE IMATONG MOUNTAINS, SUDAN.

T. F. CHIPP.

The Imatong Mountains, the highest point of which is Mt. Kineti, 10,414 ft., are situated between  $4^{\circ}$  and  $4^{\circ}30'$  N and  $32^{\circ}20'$  and  $33^{\circ}$  E, just north of the boundary between the Anglo-Sudan and Uganda. Until recently these mountains had not been visited,\* and were known locally only by the names of the tribes inhabiting the hills and different parts of the mountain plateau, whilst the individual peaks were referred to by the names of the rivers to which they gave origin.

In The Geographical Journal, May 1929, there is a map accompanying Mr. Arnold Hodson's article on Journeys from Maji, South-West Abyssinia. The map has been prepared from the compilation of the Sudan Government Survey Department and is the first map to show these mountains and recognise their name as the Imatong Mountains.

Although they rise direct from the general plain of Mongalla, they form a northern continuation of the upthrusts which provide the great East African mountain systems, including Ruwenzori, Kilimanjaro, Kenya, Elgon, and the Aberdares. They are not the only group, however, and other mountain masses, such as the Dodingas, rise to the east forming "stepping stones" to the Abyssinian plateau, whilst, westwards, isolated gebels connect them with the Nile-Congo divide. Northwards, through the group known as the Nuba Mountains, they connect, again by isolated gebels, with the great trans-Sahara range of which Gebel Marra in Darfur is the southern peak. In fact, throughout the Anglo-Sudan, north of the Sudd in Upper Nile Province, these solitary, conical, flat-topped, or razor-backed, rocky upthrusts are to be seen rising abruptly out of the tree-covered plains or the Nubian and Libyan deserts.

Little is known about the vegetation of the higher peaks. Gebel Marra has been visited and a few specimens obtained†, but no collections, hitherto, have been made on the high mountains immediately north of the Sudan-Uganda border.

In February last an opportunity occurred of visiting the Imatong group, and one hundred specimens were obtained from the different

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\*Geographical Journal, vol. 49, pp. 201-208.

†The Geographical Affinities of the flora of Gebel Marra. R. Good, The New Phytologist, xxiii, No. 5, pp. 266-281.





vegetation zones.\* It appears that a new northern record has been obtained for the mountain flora of the East African equatorial mountains, and that a further link has been established with the vegetation of the Abyssinian plateau and the high mountains of west equatorial Africa.

The approach to the Imatongs was from the west, and motor transport was possible from Rejaf on the Bahr-el-Gebel, the southern terminus of the Nile service of steamers from Khartoum. The river is not navigable southwards owing to rapids, but Rejaf is the centre of dry-season motor car services from Nairobi and Kampala, and there is a daily service of lorries along an excellent all-weather road from Aba in the Belgian Congo. Eastwards, however, there is no regular traffic and the dry-season motor car tracks have only recently been opened up by the District Commissioner.

Rejaf was left early in the morning, but owing to engine trouble Opari, the headquarters of the District, was not reached till five in the evening. For the first 40 miles the road runs southwards parallel with the Bahr-el-Gebel and at about 8 miles distance. The vegetation is that typical of the river basins of this part of the Sudan, dwarf tree species of *Acacia*, *Terminalia*, *Euphorbia*, *Tamarindus*, *Kigelia*, *Zizyphus* and *Balanites*, standing isolated over a "tall-grass" ground-cover, and gnarled, blackened, and twisted by the annual fires.

For the last 40 miles of the journey the road went eastwards, and ascended to ground which was generally about 2000 ft. altitude. Here the tree constituents of the vegetation changed, and representatives of the next southern great transcontinental belt of vegetation took their place. Noticeable amongst them were species of *Erythrina*, *Dombeya*, *Azalia*, and *Butyrospermum*. The general physiognomy of the vegetation remained the same, and the tall dry herbs and grass provided abundant inflammable material for the fires, which, in many cases, kept tall trees to the form of a stake or stunted bush. The brilliant scarlet flowers of *Erythrina tomentosa* R.Br. (22) and the masses of cherry-like blossom of *Dombeya reticulata* Mast. (21) were a welcome relief in a dry undulating landscape.

The following day motor cars were used as far as Lotti, a further 40 miles eastwards. The route crossed the wide sweeping undulations of the country, gradually mounting up to some 3,500 ft. Although big game abounds, few animals were seen, as the motor car disturbed the general quietude of these grassy tracts and gave good warning of our approach. One small herd of giraffes was passed and some gazelles and antelopes.

On approaching the base of the hill on which the Lotti Rest House is built, and where the motor car track ends, a belt of closed fringing forest was crossed. This was the first piece of Closed

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\*The collection is deposited in the Herbarium at Kew. The serial numbers given after botanical names refer to the collector's field numbers of this collection.

Equatorial Forest seen on the journey southwards through Egypt and the Sudan, and is the northern limit, in these parts, of the great Cameroons-Congo forest, which crosses the Rift Valley in places, penetrates the ravines, and pushes along the valleys of Uganda towards Abyssinia. This belt was composed of tall forest trees with good boles and buttresses, and with crowns completely closing the canopy. Lianes were plentiful, and the shrub curtain of the equatorial forest prevented one seeing more than a few yards in any direction. *Alstonia*, *Entandrophragma macrophyllum* A. Chev. (15), *Khaya grandifoliola* C.DC. (24), and *Chlorophora excelsa* Benth. & Hook. f. (19, 20), were amongst the largest trees, whilst wild Coffee, *Coffea robusta* Linden (10, 11), and Rubiaceous and Acanthaceous shrubs helped to form the lowest stratum of the canopy. The belt was only  $1\frac{1}{2}$  miles wide in this part but continued eastwards round the southern base of the foothills towards Uganda.

The Rest House at Lotti is built on a little spur of the foothills, some 500 ft. above the plain and is reached by a narrow steep track which is found rather trying by travellers who have come the last thousand miles by steamer and motor car. One is well rewarded for the short climb, for an excellent view is obtained southwards over the undulating country to the mountains beyond Kajo Kaji and Nimule, whilst at dusk the grass fires which rage at this time of the year and work their way up the mountain sides above provided a brilliant spectacle.

During the night a local edition of a "haboob" provided an unpleasant experience. The wind roared over the mountains carrying clouds of dust and debris, but no rain fell. Owing to the recent fires over the country-side partially burnt and charred vegetable matter was blown over everything, and camp kit, clothes, and all else were covered with a greasy black deposit.

From Lotti the march along the Acoli Hills was begun. These foothills, which rise to some 7000 ft., encircle the west and south aspects of the Imatongs, and are inhabited by the Acolis from whom they take their name. Owing to the preventive measures against sleeping sickness the Acolis are all living above the 4000 ft. contour, whilst they go down to their farms in the plains daily. They are a bright, cheerful people, and seem to have thrown off the sleeping sickness scourge since they have moved their homes to the high ground, but the daily walk to their farms below is somewhat of an undertaking.

Carriers were obtained for each day's march from the village where the nightly halt was made. The track followed the line of villages around the mountain side, so that no difficulty was experienced with regard to carriers. The track itself, however, was difficult for, for the most part, it took a bee line from one hill top to the next and this entailed many steep descents and equally steep ascents during each day's march. At other times it was cut along the hill side, with a drop of 1500 ft. to the rolling plains to the

PLATE VIII



For explanation of Plates, see page 197

*To face page 180.*

PLATE IX

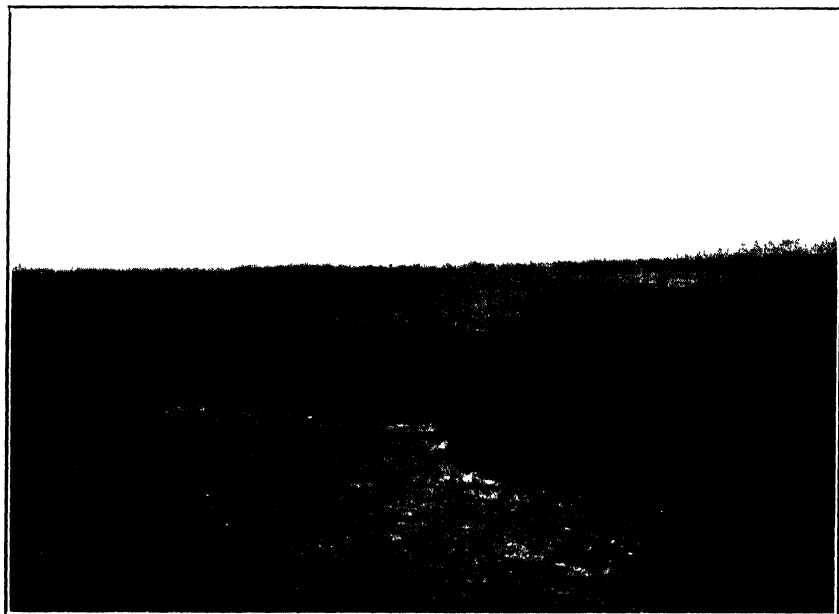


Fig. 1



Fig. 2

south, and with the steep mountain sides above. Again at intervals the hill tops fell back in a semicircle and many hill basins and hanging valleys, each of several thousand acres, were found between 4000 and 5000 ft. altitude.

The types of vegetation alternated. The hill sides were covered with dry grass above which the isolated trees stood out. At a distance these looked like grassy swards, but directly they were entered the 12 to 15 ft. grasses, chiefly *Hyparrhenia cymbaria* Stapf (27) and *Pennisetum purpureum* Schum. (29), obscured all view. In the ravines the Closed Forest threaded its way up the mountains along the banks of the streams, which at these heights were perennial. *Khaya grandifoliola* C.DC. (24) appeared in nearly all these strips of forest and its open capsules were common on the forest floor. The contrast between these dry hot hill sides and the shady coolness of the banks of the forest-covered streams was striking in its abruptness and intensity.

A digression was made at the end of the second day's march among the Acoli Hills, and a trail followed southwards towards a basin containing a stretch of closed forest some hundreds of acres in extent. This is known as the Laboni Forest and was reported to contain much wild Coffee. It is rarely visited as the country is uninhabited along the Uganda border, and a herd of some 200 elephants effectively polices the area against the occasional hunter.

The last hour's march towards this forest is through a tract occupied exclusively by the tufted bamboo *Oxytenanthera abyssinica* Munro (51), which extends to several thousands of acres and effectively prevents any other type of vegetation from existing on the same site. There was no breeze and the spreading crowns of the bamboo clumps were much too thin to afford any protection against the blazing sun. Occasionally streams were crossed, and here were seen for the first time *Dracaena fragrans* Gawl. (53), *Phoenix reclinata* Jacq. (50), and *Senecio multicorymbosus* Klatt (52), whilst epiphytes such as the shield ferns *Platynerium angolense* Welw. (30), and *Drynaria Willdenovii* T. Moore (54), and the lichens *Usnea longissima* Ach. (57), *U. florida* Web. (57), and *Parmelia perlata* Ach. (58) betokened the approach of the moister atmosphere of the higher mountain sides.

To reach the patch of forest a further stretch of tall Grass—fire-swept—woodland in a basin of the hills had to be crossed, and some of the plants representing this type of vegetation were collected. Some parts of this grassland had recently been burnt and here were many plants whose flowers were borne on short herbaceous stems up to 12 inches high arising from buried woody rootstocks. Amongst them were the mauve-flowered *Ruellia sudanica* Lind. (32); the yellow *Crotalaria senegalensis* Bacle (33); *Trichodesma physaloides* A.DC. (34) with white petals streaked at the base with brown, and white anthers; *Sonchus Elliotianus* Hiern (35) with dark orange ray florets and yellow disk; the purple-flowered *Scutellaria*

*pauciflora* Baker (38) ; and *Peristrophe usta* C.B.Cl.(41) with mauve flowers. Where the grass was still standing *Clerodendron cordifolium* A. Rich. (48, 49) commonly occurred, with its whitish green flowers, scarlet at the base, or its dark green shining fruit partially enclosed by the claret-coloured calyx. One of the commonest trees, in flower at this time, was *Combretum laboniense* M.B. Moss (45).

The following morning a return trail was followed which led through part of the Laboni forest. The wild Coffee (*C. robusta* Lind., 40) was a lovely sight and is evidently growing under ideal conditions. It was in full bloom and the long spreading branches were loaded with pure white flowers whilst the ground around was strewn with berries. The predominant trees were isolated and some forty yards apart ; the closed canopy was provided by trees from 20 to 30 ft. high. Lianes and leafy curtains of other climbers and shrubs filled in the understructure of the forest so that herbs were practically absent. A specimen of *Polystictus xanthopus* Fries (60) was growing on a fallen log. Where sufficient light penetrated the canopy the Coffee had germinated and sturdy seedlings were growing up to fill the gap. A collection of the shrubs growing in association with the Coffee was made. These proved to be *Argomuellera macrophylla* Pax (36) ; *Hormogyne altissima* A.DC. (37) ; *Ouratea densiflora* De Willd. & Dur. (39) ; *Coffea spathicalyx* K. Schum. (47) ; *Whitfieldia longifolia* T. And. (42) ; *Lankesteria elegans* T. And. (43) ; *Kigelia aethiopica* Decne. (44) ; and *Belonophora glomerata* M. B. Moss (46).

The next day camp was moved to the head of the valley, at Issore (Onyira), at an altitude of 4616 ft. A neck of higher ground was crossed during the day's march and from here it was seen that the Combretaceous trees of the Tall Grass-Woodland were replaced rather higher up the mountain side by a conspicuously flat-topped *Acacia* (*A. abyssinica* Hochst., 55), whilst the grasses themselves were only from 6 to 8 ft. high. In the ravines the mountain flora was beginning to appear and the first specimens of the giant *Lobelia Giberroa* Hemsl. (56), some 18 ft. tall, were collected.

The bracken fern, *Pteridium aquilinum* Schott. (28), was now common and came up freely around the village wherever any attempt at cultivating the ground had been made.

The following morning the great ascent of the mountain plateau was begun soon after dawn. For the first four hours the climbing was particularly trying ; the going was bad, the tall grasses were constantly slashing the face, whilst their cane-like stems lying obliquely across the track were a perpetual source of slipping and stumbling. At times the track came into the open and bare sheets of rock had to be surmounted. Luckily it was too early in the day for them to have become heated. The Aloes, which projected from every crack of the rocky surfaces, bore testimony to the heat in the dull red colouring of their leaves.

The weather was perfect, and by the time the mountain vegetation was reached at about 8000 ft. there was a strong wind blowing which was very invigorating and made the remainder of the day's march less strenuous. The neck of Mt. Kineti was crossed to the south of the top of the mountain at about 9000 ft. altitude, and then the track wound along the mountain side through meadows of short grass, or through the ravine forests composed principally of *Podocarpus milanjanus* Rendle (85, 104), and festooned with mosses, chief amongst which was *Pilotrichella ampullacea* Broth. (88). A mountain bamboo, a species of *Arundinaria* (94) near *A. alpina* K. Schum., appeared as a fringe to the forests. To reach the camp, a collection of grass huts—Kippia, 8744 ft., a valley had to be descended and a further climb of some hundreds of feet was entailed. The day's march took just under eight hours continuous walking and climbing.

Time only permitted one day to be spent on the mountain plateau and this was devoted to reaching the cairn on Mt. Kineti, 10,414 ft.

It was first necessary to drop down into the valley and then ascend the 2000 ft. to the top. The climb was through the meadows which, where burnt, were beautiful with a dark blue and yellow Irid (*Moraea diversifolia* Baker, 89); a yellow *Hypoxis urceolata* Nel (103), and the white Larkspur (*Delphinium candidum* Hemsl., 70, 100) showed up strikingly against the charred tufts of the burnt grass. A belt of *Podocarpus* forest was crossed and here specimens of the giant *Lobelia*, bushy Groundsels, the mountain blackberry (*Rubus Steudneri* Schw., 61), the Stag's Horn Moss (*Lycopodium clavatum* L., 90), and a sedge 5ft. high, *Cyperus derreilema* Steud. (75), were collected.

On emerging from the forest belt a dense growth of scrub, some 5 ft. high, every bush of which appeared to be armed, was encountered, and only penetrated after an exhausting fight. The thickly interlaced armed Brambles and the hooked *Dipsacus pinnatifidus* Steud. (67), and species of *Solanum* tore clothes and skin alike.

Just before the crest of the mountains was won the scrub ceased and the remainder of the ascent was made over short springy turf. The forest, which had crept up the ravines, just reached the ridge towards the top, but the trees were now kept at a height of some four feet by the strong wind sweeping over the mountains, which necessitated the wearing of all additional garments and putting down the chin strap of the helmet.

The woody species which approached nearest to the exposed top were *Hypericum lanceolatum* Lam. (82), beautiful with masses of large yellow flowers; *Anthospermum usambarense* K. Sch. (74) with an ericoid habit; *Lasiosiphon glaucus* Fres. (78), looking very much like an *Azalea*; *Brayera anthelmintica* Kth. (93); and *Tephrosia atrovioleacea* E. G. Baker (96).



The mountain top itself was covered with short grass and herbs, protected by the rocky outcrops. A collection of plants around the foot of the cairn comprised the showy white *Helichrysum argyranthum* O. Hoffm. (73) and the yellow *H. fruticosum* Vatke (77); *Asparagus asiaticus* var. *scaberulus* Engl. (62) sheltering under a rock; a stemless thistle with a dense rosette of leaves (*Carduus Theodori* R. E. Fries, 65); a yellow-flowered bushy Composite (*Coreopsis Chippii* M. B. Moss, 66); *Ramphicarpa recurva* Oliv. (68), a dwarf mauve-flowered herb a few inches high; blue-flowered Sow-thistles (*Lactuca capensis* Thunb., 69, 72), and a blue-flowered scented Mint, 18 inches high (*Micromeria biflora* Bth., 76). Nestling among the stones at the foot of the cairn, its straggling shoots rising some 6 inches high, and bearing pretty dark and light blue flowers, was *Lobelia dissecta* M. B. Moss (63). On the top of the cairn was a pole and clinging to this, exposed to all wind and weather, were tufts of lichens, *Usnea florida* Webb (64), with its variety *rubiginea* Ach. (64).

The next day in crossing the meadows of the plateau at about 9000 ft. some of the grasses and herbs were collected. They grew to a height of some three feet and at a distance the meadows resembled the moorlands of English mountain scenery.

Amongst the grasses were *Digitaria uniglumis* Stapf (97), *Setaria sphacelata* Stapf & Hubbard (98), and *Exothea abyssinica* Anderss. (99). The herbs were represented by a mauve-flowered, woolly-leaved Composite, 2 ft. high (*Athrixia rosmarinifolia* Oliv. & Hiern, 71); a purple-flowered herb *Justicia Whytei* S. Moore (79); a yellow Marigold (*Coreopsis tripartita* M. B. Moss, 80); *Hebenstreitia dentata* L. (81), whose white flowers have a pretty orange centre; and the little mauve-blue *Lactuca capensis* Thunb. (102).

Along the borders of the ravine forests was a certain amount of scrub whose plants did not penetrate the meadows individually and yet appeared to have been crowded out of the forest. There was the yellow-flowered succulent *Kalanchoe Petitiana* A. Rich. (83), 3 ft. high; a white-flowered straggling shrub, *Cyathula Schimperiana* Moq. (84); the yellow-flowered *Cineraria kilimandscharica* Engl. (86); *Hyparrhenia cymbaria* Stapf (87), which grew to a height of 7 ft., was a grass which was not found in adjacent meadows and seemed to keep to the edge of the forest. A curious succulent Labiate, growing as a bush to a height of 6 ft., and conspicuous from its dark blue calyx and flower stalks, was a species of *Coleus* (91); the heliotrope-flowered *Bothriocline Schimperii* Oliv. (92) was common; *Tephrosia atrovioleacea* E. G. Baker (96) had the habit and appearance of a rose bush, and with its deep mauve flowers and black velvet pods made a striking feature of the scrub; over the bushes was a straggling *Clematis* (101) mostly with masses of feathery fruit; a pretty pale yellow-flowered climbing Pea (*Vigna Schimperii* Baker, 105) was found on a tree trunk; whilst the whorls of flaming orange flowers of *Leonotis velutina* Fenzl. (107) stood up strikingly in the tangled vegetation.

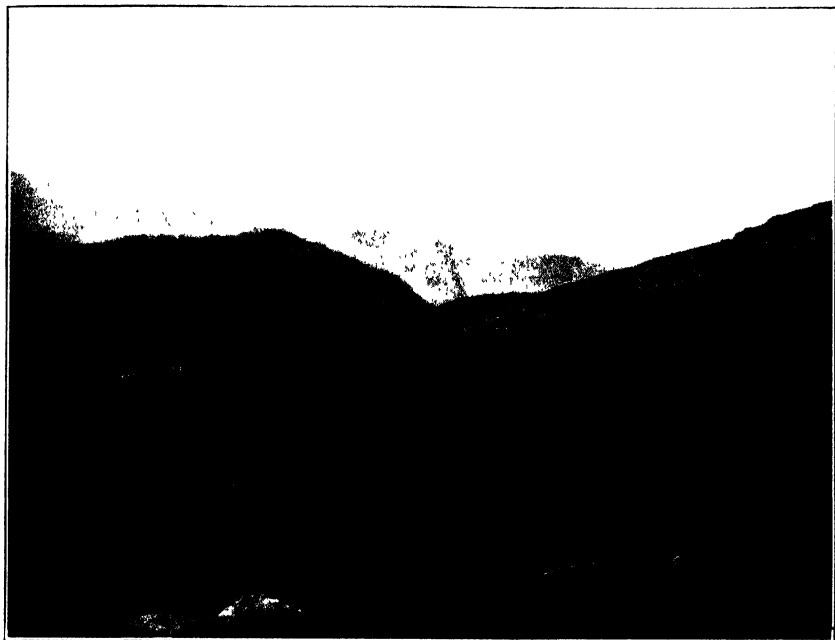
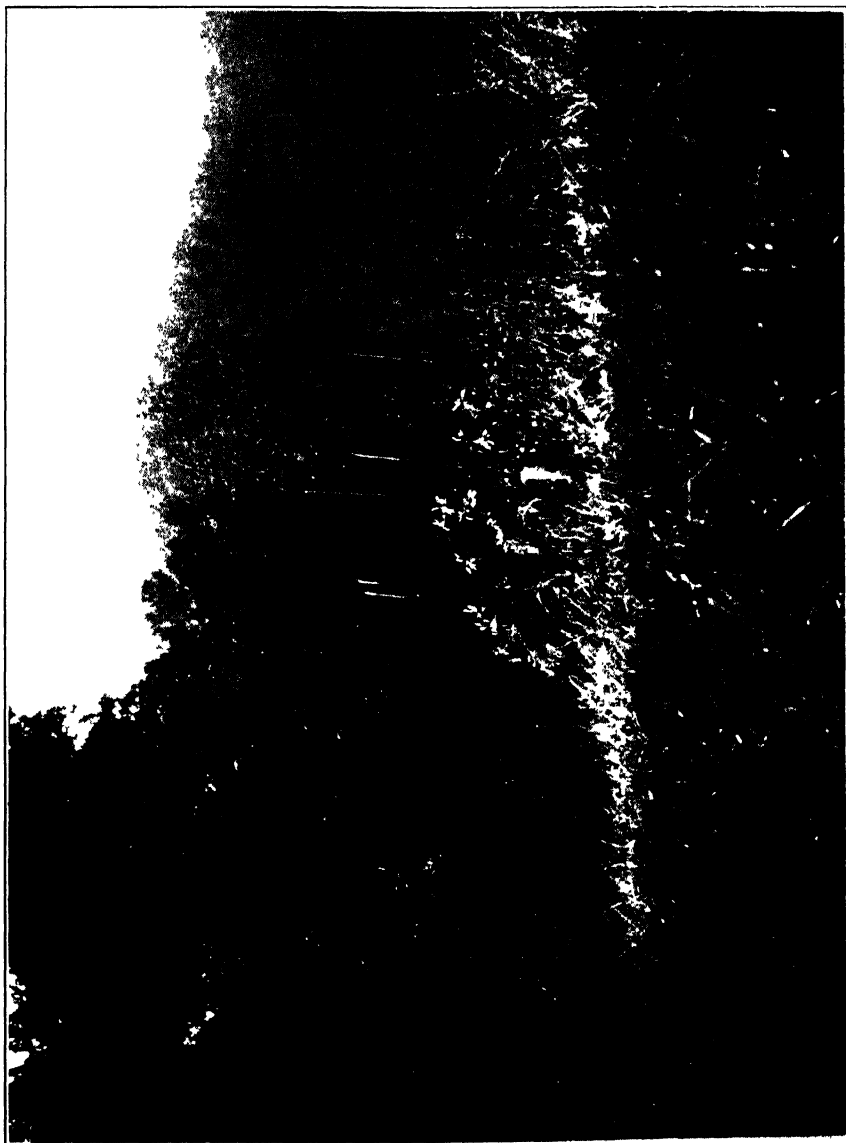


Fig. 1



Fig. 2

PLATE XI



At the edge of the plateau, at about the same altitude as they were found on the other side of the plateau, about 8000 ft., were specimens of *Protea abyssinica* Willd. (108), and in a ravine nearby, standing out amongst the tree tops, but inaccessible, were the heavy candelabra-like crowns of a *Euphorbia* at least 60 ft. high, with a cylindrical stem, and ascending constricted branches 20 ft. long.

The descent was more tiring than the climb. In a distance under three miles the trail drops from the edge of the plateau at 8000 ft. to the plain 6000 ft. below. The march was exacting and the carriers laden, so that it was not found possible to make any further collection of the zones of mountain vegetation through which the trail dropped. At one part a ravine filled with *Vernonias*, 20 ft. high, a mass of mauve and white blossoms, presented a magnificent spectacle.

Logoforok, on the plain at the east side of the mountain opposite Ikoto Post, was reached that evening and the return journey to Mongalla made by motor car.

The remainder of this paper, dealing with the phyto-geographical affinities of the flora, as represented in the collection made on this tour, together with the enumeration of the specimens, and the descriptions of the new species, has been prepared by Miss M. B. Moss, of the Herbarium, Royal Botanic Gardens, Kew.

#### PHYTO-GEOGRAPHICAL AFFINITIES OF THE FLORA OF THE IMATONG MOUNTAINS.

In order to study the relationships of the flora of these mountains with other parts of Africa it seems preferable to consider each zone separately.

(1) The tall grass—fire-swept—woodland from 2000 ft. up to 4000 ft. contains a few trees such as *Dombeya reticulata* Mast., with a wide westerly distribution as far as Nigeria, and *Lannea Barteri* Engl., known hitherto only from Upper Guinea, whilst *Erythrina tomentosa* R. Br. and *Combretum splendens* Engl. extend in a north and south direction from the Sudan to Rhodesia. The herbaceous vegetation, however, is more widely distributed throughout Tropical Africa, some of it extending into South Africa; amongst the latter are *Crotalaria senegalensis* Bacle (to Natal), *Trichodesma physaloides* A. DC., the grass *Hyparrhenia cymbaria* Stapf (to Natal), and the cosmopolitan bracken fern, *Pteridium aquilinum* Schott. *Lissochilus mediocris* Rendle, *Ruellia sudanica* Lindau and *Clerodendron cordifolium* A. Rich. are confined to East Africa, none of them reaching further south than Tanganyika Territory.

(2) The closed equatorial forest, from 4000 to 5000 ft., contains a number of species of woody plants, some of which are apparently undescribed. A few are widely distributed throughout tropical Africa, such as *Argomuellera macrophylla* Pax (Euphorbiaceae) and

*Chlorophora excelsa* Bth. & Hk. f. (Moraceae). Most of the others, however, are local or with a remarkably disconnected distribution. This may be due to our lack of knowledge of the intervening regions or it may be an actual fact that they occur only in these widely separated parts. Such are *Hormogyne altissima* A. Chev.\*, known from French Guinea and the Gold Coast, and *Coffea spathicalyx* K. Sch., recorded only from the Cameroons. The herbs of this area are fairly widely distributed.

(3) The fringing forest, above the closed equatorial forest, consists mainly of typically East African plants such as *Lobelia Giberroa* Hemsl., *Leonotis velutina* Fenzl., *Protea abyssinica* Willd. (also in Angola), and *Senecio multicorymbosus* Klatt, with a few widely spread species, as *Phoenix reclinata* Jacq., *Drynaria Willdenowii* T. Moore and *Dracaena fragrans* Gawl.

(4) The tall grass—fire-swept—woodland, 5000 to 8000 ft., is composed of the local *Acacia abyssinica* Hochst. and the widespread bulbous *Urginea micrantha* Solms-Laub.

(5) The mountain ravines, 8000 to 10,000 ft., contain the only gymnosperm, *Podocarpus milanjanus* Rendle, which extends southwards to Gazaland. Here, however, representatives of both the northern and southern floras meet, and it would appear probable that this flora represents the most ancient type. *Rubus Steudneri* Schweinf. occurs with the *Podocarpus* and is closely allied to the east tropical and south African *R. rigidus* Sm. ; it is also found in S.W. Abyssinia and Kenya.

(6) The north and south element is also repeated in the herbaceous vegetation of the mountain meadows, *Delphinium candidum* Hemsl. being the only northern representative, whilst *Hebenstreitia dentata* L., *Moraea diversifolia* Bak., *Lactuca capensis* Thunb., *Hypoxis urceolata* Nel and *Cyrtanthus* sp. have a strong southern flavour. Of the grasses which commonly occur in these mountain meadows *Digitaria uniglumis* Stapf has been recorded from Eritrea, Abyssinia, Uganda—including Mt. Ruwenzori, Kenya, and southwards to Rhodesia. *Setaria aurea* Hochst. is common throughout Tropical Africa, and on Mt. Kilimanjaro up to 11,000 ft. *Exothea abyssinica* Anderss. occurs on the mountains from Eritrea and Abyssinia to north Nyasaland.

(7) The flora of the mountain tops, 10,000–10,414 ft., shows similar affinities, with the cosmopolitan *Asparagus asiaticus* L. and *Micromeria biflora* Bth., whilst *Hypericum lanceolatum* Lam. and *Carduus Theodori* R.E.Fries represent the northern, and *Lasiosiphon glaucus* Fres. the southern floras.

\*The genus *Hormogyne* A.DC. was originally known only from Australia, and has now been reduced by Engler to a section of *Sideroxylon*. It seems very doubtful whether the African species referred to *Hormogyne* by Chevalier can be congeneric with the Australian species.

ENUMERATION OF THE SPECIMENS COLLECTED ON THE IMATONG  
MOUNTAINS.

(Dicotyledons arranged according to Hutchinson's "Families of  
Flowering Plants".)

The following altitudes and positions are approximately correct  
for the villages and camps mentioned.

In the Acoli Hills :—

Lotti 4091 ft.  $32^{\circ}32'E$ ,  $4^{\circ}3'N$ .

Payito 4600 ft.  $32^{\circ}38'E$ ,  $3^{\circ}58'N$ .

Oketc (Odouro, Lomoarite) 4610 ft.  $32^{\circ}40'E$ ,  $3^{\circ}52'N$ .

Issore (Onyiro) 4616 ft.  $32^{\circ}50'E$ ,  $3^{\circ}54'N$ .

In the Imatong Mountains :—

Kippia 8744 ft.  $32^{\circ}53'E$ ,  $3^{\circ}58'N$ .

Ras Logoforok 8000 ft.  $32^{\circ}56'E$ ,  $3^{\circ}57'N$ .

The Laboni Forest is about  $32^{\circ}50'E$ , just north of the Uganda border,  
at an approximate altitude of 4200 ft.

*Fungi.*

**Polystictus xanthopus** *Fries.* Laboni Forest.

Growing on a dead log. No. 60.

*Lichens.*

**Parmelia perlata** *Ach.* Issore.

An epiphyte in ravines. No. 58.

**Usnea longissima** *Ach.* and **U. florida** *Web.*, also a small  
**U. barbata** *Wch.* Issore.

Found in the ravines leading up to the Imatong Mtns., at  
5500 ft. No. 57.

**Usnea florida** *Web.*, including var. **rubiginea** *Ach.* Mt. Kineti,  
10,414 ft.

On the pole and cairn at the top of the mountain. No. 64.

*Musci.*

**Pilotrichella ampullacea** *Broth.* Mt. Kineti, 10,000 ft.

The chief epiphyte festooning the forest trees at 8000–11,000 ft.  
No. 88.

*Lycopodiales.*

**Lycopodium clavatum** *L.* Near Kippia, 9500 ft.

Growing in mountain ravines. No. 90.

*Filices.*

**Pteridium aquilinum** *Schott.* Odouro.

A ground fern in the tall grass—fire-swept—woodland, appearing  
from about 5000 ft. upwards. No. 28.

**Platyserium angolense** *Welw.* Odouro.

An epiphyte on trees in fringing forest at 4000 ft., also occurring  
on trees generally at an altitude of over 5000 ft. No. 30.

**Drynaria Willdenowii** T. Moore. Issore.

A trunk epiphyte in the fringing forest. No. 54.

*Taxaceae.*

**Podocarpus milanjanus** Rendle. Mt. Kineti, 10,000 ft.

The chief tree in mountain ravine forests, the bark flaking in strips, and branches festooned with mosses and lichens. Forming pure forests, or with *Lasiosiphon glaucus* Fres. and *Hypericum lanceolatum* Lam. Trees 60 ft. or more with straight bole 30-40 ft., at an altitude of 8000-10,400 ft. No. 85.

Ras Logoforok. Young fruit green with scarlet aril, drying plum coloured with the aril shrivelling and turning black. No. 104.

*Anonaceae.*

**Monodora angolensis** Welw. Lotti.

Small tree 20 ft. high in closed fringing forest. The outer 3 petals green, brown spotted; the inner white, yellow spotted. No. 16.

*Ranunculaceae.*

**Delphinium candidum** Hemsl. Mt. Kineti, 10,000 ft.

White-spurred flower with violet anthers, delightfully scented; in mountain meadows 8000-10,000 ft. No. 70.

E. of Kippia, 9000 ft. Herb 2 ft. high; only capsules and dead stems. No. 100.

**Clematis** sp. E. of Kippia, 9000 ft.

Straggling over bushes 20 ft. high. in forests up mountain ravines. No. 101.

*Crassulaceae.*

**Kalanchoe Petitiana** A. Rich. Mt. Kineti, 10,000 ft.

Yellow-flowered herb 3 ft. high, in forested ravines. No. 83.

*Amarantaceae.*

**Cyathula Schimperiana** Mog. Mt. Kineti, 9,000 ft.

Common white-flowered straggling shrub, 10 ft. high, in mountain forested ravines, 8000-10,000 ft. No. 84.

*Thymelaeaceae.*

**Lasiosiphon glaucus** Fres. Top of Mt. Kineti, 10,414 ft.

Yellow-flowered Azalea-like shrub, 10 ft. high at mountain top, becoming a tree 50 ft. high at 8000-9000 ft. With *Anthospermum usambarense* K. Sch. and *Hypericum lanceolatum* Lam., it forms the topmost scrub on the mountain. No. 78.

*Proteaceae.*

**Protea abyssinica** Willd. Below Ras Logoforok, 6000 ft.

Freely branching tree 30 ft. high, in ravines at 5000-8000 ft. No. 108.

*Flacourtiaceae.*

**Caloncoba Schweinfurthii** Gilg. Lotti.

Small tree 20 ft. high, with heavily orange-scented flowers 3-4 inches in diameter, at the edge of the closed fringing forest. Sepals 3, petals white, anthers yellow, young leaves only seen. No. 17.

**Dovyalis macrocalyx** Warb. Lotti.

Small bush 12 ft. high, with strong stout spines and flowers in axillary clusters, at the edge of the closed fringing forest. Perianth green, filaments white, anthers yellow, disc-glands red. Vernacular name : Okyro (Acoli). No. 18.

#### *Ochnaceae.*

**Ouratea densiflora** De Willd. & Dur. Laboni Forest.

Yellow-flowered shrub 20 ft. high, in closed forest, in association with *Coffea*. The fruit is scarlet. No. 39.

#### *Combretaceae.*

**Combretum splendens** Engl. Payito.

A tree 50 ft. high growing on mountain side at the edge of the fringing forest, in fire-swept grassland. No. 23.

**Combretum laboniense** M. B. Moss, sp. nov. (see p. 195). Near Laboni Forest.

Small tree in tall grass—fire-swept—woodland. No. 45.

#### *Hypericaceae.*

**Hypericum lanceolatum** Lam. Top of Mt. Kineti, 10,414 ft.

Yellow-flowered shrub 10 ft. high ; the bark rugose and cracking into squares ; the leaves in four series. With *Anthospermum usambarense* K. Sch. and *Lasiosiphon glaucus* Fres. it forms the top-most scrub on the mountain. At lower levels the tree reaches a height of 40 ft. in forest ravines. No. 82.

#### *Sterculiaceae.*

**Dombeya reticulata** Mast. Lotti.

Tree 40 ft. high, or shrub in burnt country, with masses of "cherry blossom" flowers—the young leaves only and flowers seen. It is associated with open fire-swept woodland and tall grass, from Western Mongalla and Opari to Lotti, and on the mountain sides above Lotti. No. 21.

#### *Euphorbiaceae.*

**Argomuelleria macrophylla** Pax. Laboni.

Shrub up to 20 ft. high in forest, associated with *Coffea*. Flowers yellow with orange centre. No. 36.

#### *Rosaceae.*

**Brayera anthelmintica** Kth. Kippia.

Tree 60 ft. high with scarlet petioles, common in ravines, 8000-10,000 ft. With *Lasiosiphon glaucus* Fres., *Hypericum lanceolatum* Lam. and *Podocarpus milanjanus* Rendle it forms most of the ravine forest. No. 93.

#### *Mimosaceae.*

**Acacia abyssinica** Hochst. Issore.



Flat-topped leguminous tree 40-50 ft. high, characteristic of the tall grass—fire-swept—woodland above 5500 ft. It is almost the only tree in the fire-swept grass area at this altitude. No. 55.

*Papilionaceae.*

**Craibea utilis** *M. B. Moss*, sp. nov. (see p. 195). Lotti.

White-flowered papilionaceous tree 60 ft. high, slightly buttressed, growing in the fringing forest with *Coffea robusta* Linden. It yields good timber for native huts. No. 12.

**Erythrina tomentosa** *R. Br.* Lotti.

A leafless tree with brilliant scarlet flowers, growing in tall burnt-over grass on mountain sides above Lotti. No. 22.

**Crotalaria senegalensis** *Bacle.* Near Laboni Forest.

A small yellow-flowered papilionaceous herb, 12 in. high, arising from a woody rootstock. The flowers appear soon after a burn in the tall grass—fire-swept—woodland. No. 33.

**Tephrosia atrovioacea** *E. G. Baker.* Above Kippia, 9000 ft.

A papilionaceous shrub 6 ft. high, growing in scrub on mountain ravines, 9000-10,000 ft. The flowers are deep mauve, the pods black velvet. No. 96.

**Vigna Schimperii** *Baker.* Ras Logoforok.

Pale yellow-flowered climbing Pea, from the edge of the forests. No. 105.

*Moraceae.*

**Chlorophora excelsa** *Benth. & Hook. f.* Lotti.

Tall predominant tree in the closed forest. Nos. 19, 20.

*Meliaceae.*

**Entandrophragma macrophyllum** *A. Chev.* Lotti.

Tall tree 100 ft. high with finely lined bark, and the bottom of the bole fluted and slightly buttressed; growing in the closed fringing forest. No. 15.

**Khaya grandifoliola** *C.DC.* Payito.

A tall tree in the fringing forest. No. 24.

*Anacardiaceae.*

**Lannea Barteri** *Engl.* Payito.

Tall tree in tall grass-woodland over the mountain side, common in fire-swept country. The bark is spirally striate, and the flowers strongly syringa-scented. No. 25.

*Sapotaceae.*

**Hormogyne altissima** *A. Chev.* Laboni Forest.

Growing in the closed forest in association with *Coffea robusta* Linden. No. 37.

*Loganiaceae.*

**Nuxia sambesina** *Gilg.* Above Kippia, 9000 ft.

A tree 40 ft. high, forming one of the commonest components of the forests in the high mountain ravines, 8000-10,400 ft. No. 95.

*Rubiaceae.*

**Coffea robusta** *Linden.* Lotti.

Tree 20 ft. high in the equatorial type of fringing forest at the foot of the hills. Vernacular Name: Boon (Acoli). Wild Coffee. Nos. 10, 11. Laboni Forest, No. 40.

**Coffea spathicalyx** *K. Sch.* Lotti.

A small white-flowered tree, unknown to the natives; growing in the forest in association with *Coffea robusta* Linden. No. 13.

**Belonophora glomerata** *M. B. Moss*, sp. nov. (see p. 195). Lotti.

A small tree 30 ft. high, with white flowers, growing in the fringing forest in association with *Coffea robusta* Linden. No. 14.

**Anthospermum usambarense** *K. Sch.* Top of Mt. Kineti. 10,414 ft.

A bush 5 ft. high, forming with *Helichrysum fruticosum* Vatke and *Lasiosiphon glaucus* Fres. the highest scrub on the mountain top. It is only seen from 10,000 ft. to 10,400 ft. No. 74.

*Dipsacaceae.*

**Dipsacus pinnatifidus** *Steud.* Top of Mt. Kineti, 10,414 ft.

A scabious-like white-flowered prickly herb 6 ft. high, in scrub on the mountain top and in the forest ravines. No. 67.

*Compositae.*

**Bothriocline Schimperii** *Oliv.* var. Kippia.

Heliotrope-flowered Composite 6 ft. high, common in mountain ravines. No. 92.

**Athrixia rosmarinifolia** *Oliv. & Hiern.* Mt. Kineti, 10,000 ft.

Mauve-flowered Composite 1-2 ft. high, with woolly leaves; growing in mountain meadows. No. 71.

**Helichrysum argyranthum** *O. Hoffm.* Top of Mt. Kineti, 10,414 ft.

"Everlasting," 3 ft. high; the flowers are white with yellow centre, and the plant is common all over the mountain meadows at an altitude of 9000-10,000 ft. No. 73.

**Helichrysum fruticosum** *Vatke.* Top of Mt. Kineti, 10,414 ft.

Yellow-flowered Composite with white woolly leaves growing in scrub on the mountain top. No. 77.

**Coreopsis Chippii** *M. B. Moss*, sp. nov. (see p. 196). Top of Mt. Kineti, 10,414 ft.

A yellow-flowered Composite, 3 ft. high, in scrub on the mountain top. It also occurs in forested mountain ravines at an altitude of 8000-10,000 ft. No. 66.

**Coreopsis tripartita** *M. B. Moss*, sp. nov. (see p. 196). Mt. Kineti, 10,000 ft.

A yellow marigold, growing in mountain meadows at 8000-10,000 ft. No. 80.

**Senecio multicorymbosus** *Klatt.* Near Issore.

A yellow-flowered Composite shrub 20 ft. high, with the habit of a *Pandanus*, growing in the fringing forest. No. 52.

**Cineraria kilimandscharica** *Engl.* Kippia.

Yellow-flowered composite 3 ft. high, common in ravines at 5000-10,000 ft. No. 86.

**Carduus Theodori** *R. E. Fries.* Top of Mt. Kineti, 10,414 ft.

A stemless thistle with purple flowers, common on the mountain top. No. 65.

**Sonchus Elliotianus** *Hiern.* Near Laboni Forest.

A pretty little Composite 6 in. high, with dark orange ray and yellow disc, growing from a woody rootstock. Flowering occurs shortly after a burn in tall grass—fire-swept—woodland. No. 35.

**Lactuca capensis** *Thunb.* Mt. Kineti, 10,414 ft.

A blue-flowered herb 2 ft. high, in scrub on the mountain top, and in forested ravines at 8000-10,000 ft. Nos. 69, 72.

Ras Logoforok.

A pretty little mauve-blue Composite, 18 in. high ;, appearing in mountain meadows shortly after burning. No. 102.

#### *Lobeliaceae.*

**Lobelia Giberroa** *Hemsl.* Issore.

A plant 18 ft. high with hollow cane-like stem 2 in. in diameter near the base, very brittle and laticiferous. The flower spike is 5½ ft. long, and the biggest leaves 2 ft. long and 8 in. broad. Growing in sheltered ravines. No. 56.

**Lobelia dissecta** *M. B. Moss*, sp. nov. (see p. 197). Top of Mt. Kineti, 10,414 ft.

A pretty plant 6 in. high, with dark and pale blue flowers. It is the highest phanerogam in the Sudan, growing against the cairn on the top of Mt. Kineti. No. 63.

#### *Boraginaceae.*

**Trichodesma physaloides** *A.DC.* Near Laboni Forest.

A herb 2 ft. high growing from a woody rootstock. The petals are white, brown-streaked towards the base, and the anthers white. It appears shortly after a burn in tall grass—fire-swept—woodland. No. 34.

#### *Scrophulariaceae.*

**Rhamphicarpa recurva** *Oliv.* Mt. Kineti, 10,414 ft.

A mauve-flowered herb a few inches high, growing on the mountain top. No. 68.

**Hebenstreitia dentata** *L.* Mt. Kineti, 10,000 ft.

A herb 18 in. high, the flower white with orange centre, growing in mountain meadows at 8000-10,000 ft. No. 81.

#### *Bignoniaceae.*

**Kigelia aethiopica** *Decne.* Laboni Forest.

A shrub or tree 30 ft. high with dark orange flower, growing in the closed forest in association with *Coffea robusta* Linden. No. 44.

#### *Acanthaceae.*

**Ruellia sudanica** *Lindau.* Near Laboni Forest.

A musk-like woody herb 8 in. high growing from a woody rootstock. The flower is mauve-blue, the corolla falling early. The plant appears shortly after a burn in tall grass—fire-swept—woodland. No. 32.

**Peristrophe usta** C.B.Cl. Near Laboni Forest.

A small mauve-flowered herb growing from a woody rootstock, appearing shortly after a burn in tall grass—fire-swept—woodland. No. 41.

**Whitfieldia longifolia** T. And. Laboni Forest.

A white-flowered shrub 20 ft. high, in closed forest in association with *Coffea robusta* Linden. No. 42.

**Lankesteria elegans** T. And. Laboni Forest.

Bright orange-flowered shrub 10 ft. high, in closed forest in association with *Coffea robusta* Linden. No. 43.

**Justicia Whytei** S. Moore. Mt. Kineti, 10,000 ft.

Purple-flowered herb in mountain meadows at 8000–10,000 ft. No. 79.

#### *Verbenaceae.*

**Clerodendron cordifolium** A. Rich. Odouro.

A shrub 2 ft. high with claret-coloured calyx, white corolla with scarlet base, and green shining fruit, in tall grass—fire-swept—woodland. Nos. 48, 49.

#### *Labiatae.*

**Scutellaria paucifolia** Baker. Near Laboni Forest.

A purple-flowered herb growing from a woody rootstock and appearing shortly after a burn in the tall grass—fire-swept—woodland. No. 38.

**Micromeria biflora** Benth. Mt. Kineti, 10,414 ft.

A blue-flowered scented mint, 18 in. high, on the mountain top. No. 76.

**Coleus** sp. Mt. Kineti, 9000 ft.

A succulent bush 6 ft. high, the calyx and flower stalk dark blue, in mountain ravines. No. 91.

**Leonotis velutina** Fenzl. Ras Logoforok.

A handsome orange-flowered herb 5 ft. high, in ravines on the east of the Imatong Mtns. at 5000–8000 ft. No. 107.

#### *Liliaceae.*

**Dracaena fragrans** Gawl. Issore.

A tree 50 ft. high, in the fringing forest and frequent in ravines. The inflorescence stalk is 3 ft. 6 in. long, the leaves 3 ft. long and 6 in. broad. No. 53.

**Urginea micrantha** Solms-Laub. Issore.

A bulbous plant with the scape and the outside of the perianth dark claret-coloured. It appears soon after a burn on rocky ground in tall grass—fire-swept—woodland. No. 59.

**Asparagus asiaticus** var. **scaberulus** Engl. Top of Mt. Kineti, 10,414 ft.

A dwarf plant sheltering under rocks. No. 62.

*Amaryllidaceae.*

**Hypoxis urceolata** *Nel.* Ras Logoforok.

A bulbous herb 18 in. high, the bulb yellow when freshly cut. The perianth is greenish outside, the inside is buttercup yellow, as are also the anthers and stigma. It appears in the mountain meadows shortly after burning. No. 103.

**Cyrtanthus** sp. (§*Gastronema*). Ras Logoforok.

A salmon-pink Amaryllid, 6 in. high, with white bulb and no leaves, growing in mountain meadows. The perianth is white-edged, the bracts mauve. *Mrs. Hamilton Lee* 106.

*Iridaceae.*

**Moraea diversifolia** *Baker.* Kippia.

A herb up to 1 ft. high with the bulb several inches deep. The perianth is purple-lilac to pale blue with bright yellow triangular markings. Grows in fire-swept mountain meadows. No. 89.

*Orchidaceae.*

**Lissochilus mediocris** *Rendle.* Laboni Forest.

A leafless ground orchid, 20 in. high among 12 ft. tall grasses. The lip is dark purple, the 3 upper perianth lobes violet. No. 31.

*Palmeae.*

**Phoenix reclinata** *Jacq.* Near Laboni Forest.

Palm 50 ft. tall growing in ravines in the fringing forest. No. 50.

*Cyperaceae.*

**Cyperus derreilema** *Steud.* Mt. Kineti, 10,414 ft.

Cyperaceous plant 5 ft. high, in mountain forest ravines and in scrub at 5000–10,400 ft. No. 75.

*Gramineae.*

**Hyparrhenia cymbaria** *Stapf.* Oketc.

A grass 12–15 ft. high, one of the common ones found in the tall grass—fire-swept—woodland in Eastern Mongalla. No. 27.

**Pennisetum purpureum** *Schum.* Odouro.

Grass 12 ft. high, one of the common constituents of the tall grass—fire-swept—woodland. No. 29.

**Oxytenanthera abyssinica** *Munro.* Near Laboni Forest.

Bamboo 20 ft. high, clumps covering thousands of acres in fire-swept country. No. 51.

**Hyparrhenia cymbaria** *Stapf.* Kippia.

Grass up to 7 ft. high, growing on the edge of ravines but not in the meadows, up to an altitude of 10,000 ft. No. 87.

**Arundinaria** sp. near **A. alpina** *K. Schum.* Kippia.

Bamboo with brown stem, in ravines with *Cineraria kilimandscharica* Engl. and *Brayera anthelmintica* Kth. at an altitude of 8000–10,000 ft. No. 94.

**Digitaria uniglumis** *Stapf.* E. of Kippia, 9000 ft.

A grass 2 ft. high, one of the commonest constituents of the mountain meadows. No. 97.

**Setaria sphacelata** Stapf & Hubbard. E. of Kippia, 9000 ft.

A grass 3 ft. high, one of the commonest constituents of the mountain meadows. No. 98.

**Exothea abyssinica** Anderss. E. of Kippia, 9,000 ft.

A grass 2 ft. high, forming a common constituent of the mountain meadows. No. 99.

#### NEW SPECIES FROM THE IMATONG MOUNTAINS.

**Combretum laboniense** M. B. Moss, sp. nov. ; affinis *C. hypopilino* Diels, sed indumento longiore, filamentis longe exsertis valde distincta.

*Arbor* minor, ramulis junioribus molliter pubescentibus. *Folia* elliptica, apice acuminata, basi rotundata vel late cuneata, circiter 9 cm. longa et 4 cm. lata, utrinque tomentosa, supra demum glabrescentia, nervis lateralibus utrinsecus circiter 8 ; petioli 1-1.5 cm. longi, pubescentes. *Inflorescentia* axillaris, racemosa, pluriflora, usque ad 7 cm. longa, pubescens ; flores sessiles ; calyx campanulatus, 4-lobatus et 4-angulatus, 5 mm. longus ; petala 4, late obovata, apice emarginata, basi breviter unguiculata, 2.5 mm. longa et lata, glabra ; stamina 8, longe exserta ; antherae subglobosae, 1 mm. longae, filamentis 1.2 cm. longis glabris ; stylus cylindricus, 6 mm. longus, glaber, stigmatibus truncato ; discus cupuliformis, ad marginem dense villosus ; ovarium tomentosum.

SOUTHERN SUDAN : near Laboni Forest, Imatong Mtns., 1300 m. in tall grass—fire-swept—woodland, Feb., *Chipp* 45 (type).

**Craibeia utilis** M. B. Moss, sp. nov. ; affinis *C. atlanticae* Dunn, sed foliolis et inflorescentiis majoribus, pedicellis brevioribus differt.

*Arbor* 20 m. alta, ramulis longitudinaliter striatis glabris vel infra stipulas pilis nigris parce indutis ; gemmae subglobosae, induratae. *Stipulae* mox deciduae. *Folia* 3-vel 5-foliolata, circiter 26 cm. longa ; rhachis glaber, ad basin rugosus ; foliola alterna, ovato-oblonga, apice obtusa, sensim acuminata, basi late cuneata, 10-14 cm. longa, 5-6 cm. lata, chartacea, glabra, utrinque crebre reticulata, nervis lateralibus utrinsecus circiter 7 arcuatis infra prominentibus ; petioli 5-6 mm. longi, rugosi. *Inflorescentia* paniculata, terminalis, dense brunneo-tomentosa ; pedicelli 3 mm. longi ; calyx 5 mm. longus, lobis late triangularibus alte connatis ; corolla alba ; vexillum late ellipticum, apice emarginatum, viridinoatum ; alae oblongae, unguiculatae, basi in latere superiore sagittatae, liberae ; carina alis similis ; stamina 10, diadelphae ; antherae subglobosae, dorsifixae ; filamenta inaequilonga, glabra ; ovarium glabrum, sessile ; stylus inflexus, stigmatibus parvo capitato.

SOUTHERN SUDAN : Lotti, Imatong Mtns., 1300 m., associated with *Coffea robusta* Linden, Feb., *Chipp* 12 (type).

**Belonophora glomerata** M. B. Moss, sp. nov. ; affinis *B. coffeoidi* Hook. f., sed bracteis brevioribus, foliorum nervis lateralibus paucioribus differt.

*Frutex* circiter 7 m. altus; ramuli annotini lignosi, cinerei, hornotini glabri, nigri, internodiis elongatis. *Stipulae* lanceolatae, acutae, 1.2 cm. longae, demum induratae. *Folia* usque ad 1.5 cm. longe petiolata, oblanceolato-obovata vel elliptico-obovata, firmiter chartacea viridescencia vel leviter brunnescentia, concoloria, basi angustata, abrupte et longe acuminata, glabra, usque ad 21 cm. longa et 10 cm. lata, nervis lateralibus utrinsecus 6 infra prominentibus. *Flores* in axillis foliorum glomerati, subsessiles vel breviter pedicellati; alabastra elongata, minute pubescentia, sub anthesin 8 mm. longa; calycis lobi ovati, ciliati, 1.5 mm. longi, dextrorsim contorti; calycis tubus 1.5 mm. longus, pubescens; corollae tubus 1.2 cm. longus, anguste cylindricus, superne pubescens, intus glaber; lobi 5, anguste elliptici, dextrorsim contorti; antherae longe ellipticae, inclusae, filamentis brevissimis; stylus crassus, brevis; stigma subcylindricum, apice 2-lobum; ovarium subglobosum, pubescens, 2-loculare.

SOUTHERN SUDAN: Laboni Forest, Imatong Mtns., 1300 m., associated with *Coffea robusta* Linden, Feb., *Chipp* 46 (type); Lotti, 1300 m., Feb., *Chipp* 14.

UGANDA: Mawokota, Feb., *E. Brown* 159.

**Coreopsis Chippii** *M. B. Moss*, sp. nov.; affinis *C. macranthae* Sch. Bip., sed foliis et capitulis minoribus, achaeniis truncatis nudis differt.

*Suffrutex* 1 m. altus, ramulis puberulis et nodis prominentibus. *Folia* opposita, ad basin connata, valde dissecta, circiter 2 cm. longa, segmentis linearibus glabris vel glabriusculis. *Capitula* subcorymbosa, subglobosa, 1 cm. diametro, flava, pedunculo 1.2 cm. longo dense puberulo; involucri duplex, bracteis liberis exterioribus angustis herbaceis saepe patentibus, interioribus ad marginem membranaceis majoribus striatis; paleae concavae, membranaceae, flores disci subtendentes; flores radii 1-seriati, neutri, ligulis 3-dentatis 1 cm. longis; flores disci apice breviter 5-fidi; antherae basi minute 2-dentatae, apice breviter productae; styli rami truncati, minute appendiculati. *Achaenia* a dorso compressa, anguste obovato-oblonga, 4 mm. longa, apice truncata.

SOUTHERN SUDAN: top of Mt. Kineti, 3470 m., Feb., *Chipp* 66 (type).

**Coreopsis tripartita** *M. B. Moss*, sp. nov.; affinis *C. abyssinicae* Sch. Bip., sed foliis semper tripartitis, capitulis minoribus, achaeniis haud aristatis differt.

*Herba* erecta, ramulis glabris vel minute puberulis longitudinaliter striatis. *Folia* opposita, basi connata, tripartita, apice breviter mucronata, glabra, circiter 2 cm. longa. *Capitula* solitaria, terminalia, flava, pedunculo usque ad 6 cm. longo puberulo; involucri bractee 2-seriatae, parce tomentosae, exteriores herbaceae, oblongae, patentes, interiores submembranaceae, erectae; paleae concavae, membranaceae; flores radii ligulati, neutri, obovato-

elongati, apice 3-dentati, 1·2 cm. longi ; flores disci 4 mm. longi, apice 5-dentati ; antherae basi minute 2-dentatae, apice breviter appendiculatae ; styli rami mucronati. *Achaenia* dorso compressa, apice truncata.

SOUTHERN SUDAN : Mt. Kineti, 3470 m., Feb., *Chipp* 80 (type).

***Lobelia dissecta*** M. B. Moss, sp. nov. ; inter species africanas foliis dissectis ovario superiore satis distincta.

*Herba* usque ad 16 cm. alta, ramulis purpureis e basi abeuntibus glabris. *Folia* palmata, sessilia, lobis linearibus multis, usque ad 1 cm. longa, glabra. *Flores* caerulei, terminales vel 1-2 in axillis superioribus foliorum, pedicellis 5 mm. longis fructu multo longioribus ; calycis lobi 5, liberi, lineares, acuti, 4 mm. longi, glabri ; corolla 8 mm. longa, lobis 3 anterioribus oblongis alte connatis, 2 posterioribus anguste acuminatis ad basin divisis ; antherae filamentaque superne connata, 2 posteriores majores, 3 anteriores apice ciliatae ; ovarium superius, stylo cylindrico 3 mm. longo, stigmate capitato. *Capsula* 5 mm. longa.

SOUTHERN SUDAN : top of Mt. Kineti, 3470 m., Feb., *Chipp* 63 (type).

#### EXPLANATION OF PLATES.

PLATE VIII *Oxytenanthera abyssinica* forest in the Acoli Hills (p. 180)

PLATE IX Fig. 1 View from Loti Rest House, Acoli Hills (4500 ft.). A belt of Closed Forest (*Khaya*, *Entandrophragma*, *Alstonia*, etc) in the tall grass—fire-swept—woodland (*Erythrina*, *Dombeya*, *Combretum*, *Pennisetum*, *Hyparrhenia*, etc) (p. 181.)  
Fig. 2 Mountain meadow near Kippia (9000 ft.), Imatong Mountains (Trees *Nuxia zambesina*, herbs *Delphinium*, *Digitaria*, *Setaria*, *Exothea*, etc) (p. 181).

PLATE X Fig. 1 View from the neck of Mt. Kineti (10,000 ft.) looking southwards, showing the limit to which the *Podocarpus* forest ascends. Shrub growth of *Hypericum*, *Anthospermum*, *Lastosiphon*, etc (p. 184).

Fig. 2. The cairn on the top of Mt. Kineti (10,414 ft.). At the foot of the cairn *Lobelia dissecta*, *Carduus Theodori*, *Micromeria biflora*, etc. On the pole, tufts of *Usnea*. (p. 184).

PLATE XI. Near Ras Logoforok (8000 ft.) The edge of the *Podocarpus* forest with *Hypericum* and *Lastosiphon*: *Lobelia Giberroa* in centre, amongst the burnt grass in the meadow in foreground *Hypoxis*, *Moraea*, etc. (p. 185).

### XXX.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*\*: IV. CYTOLOGICAL OBSERVATIONS. R. O. WHYTE.

#### INTRODUCTION.

Material was collected at Potterne from certain plants of *Silene maritima* and *S. vulgaris*, in order that a study of the cytological behaviour of the plants might be made. There are actually two

\*Continued from *K.B.* 1929, p. 175.



main problems attached to the work, firstly, the effect of hybridization between the two species, and secondly, the study of sex in *Silene maritima*. It might be supposed that these two problems could be worked at separately, without fear of confusion, but such is not the case. The study of the sex problem having assumed greater importance from a cytological point of view, and being rather easier to approach, this aspect will be dealt with first.

#### SEX IN *SILENE MARITIMA*.

The influence of a time factor has already been shown to play a large part in the various sex forms of *Ranunculus acris* (Whyte 1929). In this species there were shown to be two definite phases in the development of the sporogenous tissues of a flower, namely a male or anther phase, and a female or ovule phase, and that in a normal hermaphrodite flower these two phases are distinctly successive, with little or no overlap. In certain plants, the respective periods of activity have come to overlap to a greater or less extent, with a failure in the anthers in proportion to the amount of this overlap, thus giving rise to all intermediate forms between a normal hermaphrodite and a "female" flower. This influence is present also in *Silene maritima* (Plant A.2), causing male sterility. Although from a genetical point of view this plant is a "female" (with the exceptions noted in No. 1 of this series, Marsden-Jones & Turrill 1928), a cytological examination shows that its "femaleness" does not approach that of *R. acris* "female." Instead of the reduction periods in pollen mother cells and megaspore mother cells coinciding as in the latter example, they are separated by a considerable interval, and it is generally not until pollen tetrads have been formed in quantity that degeneration of the anther sets in. It is evident that, from a purely cytological point of view, this "female" *Silene* plant belongs to the "minus normal" or "abnormal" class, these terms being used as in the *Ranunculus* work.

If the anthers of *Silene* were arranged in a descending series as in *Ranunculus*, some good pollen would be formed in the older members, or conversely, if the anthers of *R. acris* were in one whorl, it is probable that no pollen would be formed in the "minus normal" and "abnormal" plants of that species, and that these two classes would come under the head of *R. acris* "female." It is conceivable also that the genetic behaviour of the cross *S. maritima* "normal" by *S. maritima* "female" would show some relation to that found in the cross *R. acris* "normal" by *R. acris* "abnormal" or "minus normal."

It has been found in the work on *Ranunculus acris* (Marsden-Jones & Turrill mss.) that the classes "minus normal," "abnormal," etc., are purely arbitrary, it being very difficult to classify into definite groups owing to the presence of all gradations between hermaphrodite and "female." Although from a genetical point of view, the sex problem in *Silene* does not permit of the application of such arbitrary classes, owing largely to the development of

the anthers in one whorl, cytological examination shows the presence of a more or less complete series, comparable with that found in *Ranunculus*. The following table, which includes several types of plants found in the two species examined, has been prepared from the cytological evidence, with verification from genetical facts whenever possible.

<i>Plant.</i>	<i>Pollen Production.</i>
-----	Full pollen output.
<i>S. vulgaris</i> K. 454	Medium pollen output, with some instances of bad pollen tetrads, owing to tapetal failure.
<i>S. vulgaris</i> K. 525	
<i>S. maritima</i> A. 15.	
N5/18.	
<i>S. maritima</i> 21/2	Low to medium pollen output, bad pollen tetrads being more numerous owing to greater amount of tapetal failure.
<i>S. vulgaris</i> B. 1	
N3/3	
N4/15	
<i>S. maritima</i> A. 1	
N5/8	
Male fertility	
Male sterility	

*S. maritima* A2 "female" Tapetal failure occurs before pollen tetrads have changed to mature pollen.  
Pollen output nil.

The plant numbers are those used in the experimental ground at Potterne; descriptions have been given in the preceding papers of this series. Those preceded by the letter N are F<sub>1</sub> generation plants of hybrids between the two species. Examination of numerous flowers from each type of plant indicates that, while such a classification is quite feasible, any flower of any one type may vary considerably from its arbitrary position.

The male sterility line incorporated in the table is assumed to be the dividing line taken in field observations between hermaphrodite plants and "females." When the *Ranunculus* results are considered, it is only natural that *S. maritima* A. 2 should show a graded series of forms up to that line, with spasmodic crossings into the male fertility zone, as has been reported, and that the other *S. maritima* types should show a similar graded series down to the same line. That the position of *S. maritima* A. 1 near the fertility line is correct is verified by observations made at Potterne in the summer of 1928, when during that dry season, a number of "female" flowers appeared, indicating that circumstances had arisen to cause these plants to descend the scale into the male sterility zone. In other words, the time factor had become operative, and reduced a low pollen output to nil by reduction of the period of activity in the tapetum. The position of *S. vulgaris* on the table indicates that incipient sterility is still in an early stage, that the time interval between male and female reduction processes has deviated only very

slightly from that of a normal hermaphrodite *Silene*. Tapetal activity has not been affected by ovular development until a considerable quantity of mature pollen has been produced. It will be noted that no plant of those examined from this point of view in the genus *Silene* can be called a normal hermaphrodite, in the restricted meaning of the term.

#### HYBRIDS BETWEEN *S. maritima* and *S. vulgaris*.

It is evident that, with the presence of a certain amount of sterility in both parents and F<sub>1</sub> hybrids, the study of the effect of hybridization between these species is rendered rather complicated from a cytological point of view. The somatic chromosomes, 24 in number, are too small to give a suitable basis for comparison between the various types; any comparison, if at all possible, would be so forced as to be of little value. The chromosome complements of the plants used are perfectly compatible one with the other, indicating the close relationship of the two species, and the question of pollen fertility is completely obscured by the incipient sterility noted in the earlier parts of this paper. Cytological examination cannot, it seems, be of much assistance in the study of the effect of hybridization in these species of *Silene*.

#### SUMMARY.

The "time factor" which was found to explain the occurrence of various sex forms of *Ranunculus acris* (Whyte 1929) applies also to a similar question in *Silene maritima*. The overlap between the male and female phases is here not great, and pollen tetrads are formed before anther degeneration. The incipient sterility noted in the hermaphrodite plants of this species and of *S. vulgaris* is due to the effect of the time factor in a milder form.

Cytological examination of hybrid material shows complete compatibility of chromosome complements, and any sterility which may have arisen as a result of hybridisation is obscured by the other type of sterility already present, which latter has been explained by the time factor.

#### LITERATURE.

Marsden-Jones, E. M. & Turrill, W. B. "Researches on *Silene maritima* and *S. vulgaris*." *Kew Bulletin* 1928, No. 1.

Whyte, R. O. "Dioecism in *Ranunculus acris*." *Nature* cxxiii. 13 (1929).

#### XXXI.—*VIOLAE ASIATICAE NOVAE*. WILHELM BECKER.

In *Kew Bulletin*, 1928, pp. 133-140, a number of new species of *Viola* from the Andes were described by the late Herr W. Becker. The following descriptions, which deal with new species from various regions in Asia, were received from Herr Becker shortly before his death.

**Viola jangiensis** W. Bckr., sp. nov. (§ *Nomimium* Ging.); a *V. turkestanica* Reg. et Schmalh., quae folia similia interdum praebet, rhizomate crassiore brevissime articulado foliis pubescentibus stipulis non adnatis floribus minoribus breviter calcaratis distincte diversa, et huic non affinis.

*Herba* acaulis circ. 8 cm. alta. *Rhizoma* verticale, 2–3 mm. crassum, breviter articulatum, in radices elongatas lignosas crassiusculas transiens. *Folia* longissime petiolata, basi plane cordata, triangularia vel late triangulari-ovata, obtusa, plane et remote crenata, partim repando-crenata, utrinque pubescentia (praecipue infra) et glabrescentia; folia adolescentia angustiora, pubescentiora. *Stipulae* non adnatae, angustae, fuscae, usque ad 1 cm. longae, remote fimbriatae. *Flores* folia non superantes, parvi, circ. 5–6 mm. longi, verisimiliter dilute violacei; pedicelli tenues, 5–7 cm. longi, in medio bracteolati, bracteolis circ. 3 mm. longis. *Sepala* ovato-lanceolata, 2 mm. longa, lateralia 3 mm. longa angustiora, breviter appendiculata. *Petala* lateralia subbarbata; calcar acutiusculum, 1 mm. longum. *Ovarium* conoideum; stylus basi subgeniculatus, subclavatus, apice non deplanatus et non curvatus, in orificium subapertum sursum directum transiens.

INDIA: Punjab, in glareosis versus pagum Jangi in ditione Kunāwar, 11,000 ft., 17th July 1885, *Nānah* in Herb. Drummond. 2003.

**Viola cuspidifolia** W. Bckr., sp. nov. (§ *Nomimium* Ging.); ad gregem *Adnatas* W. Bckr. pertinens, a *V. betonicifolia* Sm., *Patrinii* DC. et *mandshurica* W. Bckr. rhizomate elongato verticali verrucoso valde differt.

*Herba* 8–10 cm. alta, glaberrima, cano-viridis. *Rhizoma* verticale, circ. 7–8 cm. longum, non radicellatum, 3–4 mm. crassum, tuberculatum. *Stipulae* anguste lanceolatae, usque ad partem superiorem adnatae, remote brevifimbriatae, circ. 1 cm. longae. *Folia* lanceolata, in petiolum aequilongum sensim angustata, acutiuscula, remote subserrata, 3–4 longinervia, 3–4 cm. longa et usque 1 cm. lata; nervi subtus prominentes. *Flores* folia superantes, pauci, verisimiliter dilute violacei. *Sepala* ovato-lanceolata, acuminata, appendicibus subangustioribus subquadratis. *Petala* elliptica; petalum infimum spathulatum, breviter calcaratum; calcar crassiusculum, circ. 2 mm. longum. *Stylus* basi subgeniculatus, adversus apicem sensim clavatus, apice in parte aversa erecto-marginatus, in fronte suberecto-rostellatus.

CENTRAL CHINA: W. Hupeh, April 1900, *E. H. Wilson* 2683 (type in Herb. Kew., syntype in Mus. Bot. Paris.).

**Viola cordifolia** W. Bckr., sp. nov. (§ *Nomimium* Ging.); ad gregem *Adnatas* W. Bckr. pertinens; a *V. metajaponica* Nakai foliis late cordato-ovatis glaberrimis et calcari abbreviato distincte diversa.

*Rhizoma* articulatum, breve, radicellatum, estolonosum. *Folia* in statu florifero petiolis subaequilonga apicem adversus alatis glabris

vel brevissime puberulis, basi profunde cordata plus minusve late ovata, multicrenata, glabra, excisuris plane obtusis, incisuris plus minusve obtusis, apice obtusiuscula, non acuminata. *Folia* in statu fructifero longius petiolata, basi subaperte cordata plus minusve late ovata vel triangulari-ovata; petiolis adversus apicem alatis. *Stipulae* adnatae, breves, circ. 1 cm. longae, laciniis liberis distantibus. *Flores* folia non superantes; pedunculi infra medium longe bracteolati, brevissime pubescentes, glabrescentes. *Sepala* late lanceolata, acuminata, distincte appendiculata. *Petala* superiora et lateralalia obovata; petalum infimum elongato-obcordatum, apice plane emarginato, breviter calcaratum, calcari 2 mm. longo crassiusculo. *Ovarium* conoideum; stylus basi subgeniculatus, clavatus, apice deplanatus, adversus partem aversam utrinque marginatus, in fronte brevissime rostellatus. *Capsula* subconspicua, ellipsoidea.

CHINA: Yunnan, Mengtsze, 4600 feet, on bank in shade, A. Henry 11226 (type in Herb. Kew.); Kiangsu, Prov. Liang Shan, Nanking, along walls, Oct. 1926, C. Y. Chiao, herb. Univ. Nanking 13218 (herb. Bckr., stat. fruct.).

***Viola triangulifolia*** W. Bckr., sp. nov. (§ *Nomimum* Ging.); ad gregem *Bilobatas* W. Bckr. pertinens, V. *Raddeanae* Regel affinis, foliis triangularibus latioribus et stipulis brevibus distincte diversa.

*Rhizoma* crassiusculum, articulatum, obliquum, radicibus obsitum. *Caules* 1 vel nonnulli, erecti, tenues, elongati, 20–25 cm. alti, glaberrimi. *Folia* basilaria basi subcordata, late ovata, acuta, 1–1.5 cm. longa, basi 0.5–1.2 cm. lata, longe petiolata; folia caulina adversus caulis partem superiorem gradatim brevius petiolata, basi plane cordata usque truncata, ovato-triangularia usque elongato-triangularia, basi 1.5–2 cm. lata, 3–4 cm. longa, indistincte serrata, acuta. *Stipulae* vix 1 cm. longae, subintegrae, obsolete dentatae, dimidium petioli non attingentes. *Flores* parvi, 5 mm. longi, brevissime calcarati; praeterea a V. *Raddeana* non diversa.

CHINA: Kiangsi, Hu 816 (1921, type in Herb. Kew.); herbarium de Zi-Ka-Wei, vers Kia-lou (Ou-yuen-hsien), bois, 30th April 1920, R. P. Courtois 25561 (herb. Mus. Bot. Paris.).

***Viola Prattii*** W. Bckr. sp. nov. (§ *Dischidium* Ging.); ad gregem *Brevicalcaratas* W. Bckr. pertinens, a V. *biflora* L. foliis basi non profunde cordatis, ceterum reniformibus vel rotundatis usque ovatis, plus minusve acuminatis, conspicue repando-crenatis et caulibus inde a basi longe foliatis diversa; a V. *Rockiana* W. Bckr. foliis acuminatis majoribus et caulibus altioribus validioribus differt.—Syn. V. *szetschwanensis* W. Bckr. et De Boiss. var. *nudicaulis* W. Bckr. in Beih. Bot. Ctrlbl. xxxiv. (1916) Abt. ii. p. 262.

*Herba* circ. 12 cm. alta. *Rhizoma* crassiusculum, plus minusve horizontale, articulatum, radicellatum. *Caules* 1–2, glabri, inde a basi longe nudi, solum in parte suprema foliati. *Folia* basilaria 1–2, longe petiolata, folia caulina plus minusve conferta, breviter

petiolata, subpubescentia et glabrescentia, basi plus minusve plane cordata, reniformia usque ovata, distincte acuminata, circ. 2-2.5 cm. lata et longa conspicue repando-crenata, crenis utrinque circ. 7-10. *Stipulae* late ovatae, acuminatae, subintegrae, 5 mm. longae. *Flores* plerumque 2, flavi, usque 1.5 cm. lati; pedicelli folia superantes, in medio bracteolis minutis praediti. *Sepala* anguste linearia, circ. 5 mm. longa, brevissime appendiculata. *Petala* obovata; calcar breve, 1 mm. longum, tenue, acutiusculum, subrecurvatum.

WEST SZECHUEN and TIBETAN FRONTIER: chiefly near Tachienlu, at 9000-13,500 feet, *A. E. Pratt* 864 (type in Herb. Kew.). WESTERN CHINA, shady places, 11,000-12,000 feet, July 1903, *E. H. Wilson* 3221.

### XXXII.—SPHAERALCEA CREEANA. T. A. SPRAGUE AND N. Y. SANDWICH.

The subject of the present note was first noticed in cultivation in several English nurseries in the year 1837, and was described and figured in 1838 as a new species, *Malva Creeana* Graham (Bot. Mag. t. 3698). A second illustration, also coloured, was given in Paxton's Magazine of Botany, vol. vi. facing p. 55 (1839). The plant described by Graham was received at the Edinburgh Botanic Garden in 1837, from Mr. Prince, a nurseryman of Exeter, but nothing was known of its previous history or native country. Paxton was equally in the dark as to the origin of *Malva Creeana*. The description was reproduced in Walp. Rep. i. 293 (1842). No further reference to the species has been traced until 1849, when Asa Gray (Mem. Amer. Acad. n.s. iv. 21) reduced it with a query to *Malvastrum grossulariaefolium* A. Gray (*Sida grossulariaefolia* Hook. et Arn.). The latter was based on a plant collected in the Snake Country (North-west America) by Dr. Tolmie. In 1878 Sereno Watson (Bibliogr. Ind. Am. Bot. 138) cited *Malva Creeana* as a synonym of *Malvastrum coccineum* var. *grossulariaefolium* (Hook. et Arn.) Torr. Asa Gray in 1887 (Proc. Am. Acad. xxii. 291), transferred *Malvastrum grossulariaefolium* to the genus *Sphaeralcea*, as *Sphaeralcea pedata* Torr., and observed that "*Malva Creeana* Graham in Bot. Mag. t. 3698, probably came from this, perhaps is a hybrid." In his posthumous Synoptical Flora of North America vol. i. part 1, p. 314 (1897) it is stated that "*Malva Creeana* Graham Bot. Mag. t. 3698, if N. American, probably came from *Sphaeralcea pedata*, perhaps through hybridization with something else." Rydberg, who published the new combination *Sphaeralcea grossulariaefolia* (Hook. et Arn.), also cited *Malva Creeana* as a doubtful synonym.

*Malva Creeana* was in cultivation in the Botanic Garden, Zürich, in 1852, in which year a short description and coloured figure of a hybrid between it and *Malva miniata* (*Sphaeralcea miniata*) were published in Regel, Gartenflora, i. 163, t. 16.

In the autumn of 1928, a plant of a *Sphaeralcea*, stated to have come from California, came into flower in one of the greenhouses at

Kew, and was identified with *Malva Creeana* Graham. About the same time specimens of this species were received for identification from private correspondents. For it, the new combination *Sphaeralcea Creeana* (Graham) is now proposed. *S. Creeana* certainly seems to be related to *S. grossulariaefolia*, but differs from that species in the much more dissected leaves, and the larger calyx with longer and proportionately narrower lobes. We are therefore unable to follow Asa Gray, Sereno Watson and Rydberg, who tentatively united the two species. It may be pointed out that even if *Malva Creeana*, *Sida grossulariaefolia* and *Sphaeralcea pedata* are treated as conspecific, the combined species will bear the name *Sphaeralcea Creeana*, since the oldest specific epithet is *Creeana* (1838), *grossulariaefolia* dating from 1840, and *pedata* from 1887.

It is perhaps questionable whether the genera *Sphaeralcea* St. Hil. and *Malvastrum* A. Gray are really separable. This is hinted in the Synoptical Flora, and *Malvastrum* has been definitely reduced to *Sphaeralcea* by Rydberg (Bull. Torr. Club, xl. 58 : 1913). Typical species of *Sphaeralcea* have 1-3 ovules in each loculus, and the loculus in a fruiting stage is more or less extended and empty above, whereas in *Malvastrum* the ovules are solitary and the seed conforms to the outline of the loculus (*vide* Sprague and Gray, Ill. Gen. N. Am. ii. 59, tt. 121, 122 ; 69, t. 127.) The distinction is, however, not a very sharp one. The status of *Sphaeralcea Creeana*, whether wild species or hybrid, remains doubtful. On the one hand the various species of *Sphaeralcea* hybridize readily, but on the other, no definite evidence appears to have been brought forward in support of a hybrid origin of *S. Creeana*. It seems quite possible that the plant may still be found in an indigenous condition in some parts of California, or even that it may have been collected, and assigned erroneously in herbaria to some other species. The Kew plant has not hitherto produced seed, a circumstance which added to the difficulty of determination, since the small section to which it belongs consists of "species of difficult discrimination, at least without mature fruit" (Syn. Fl. i. part 1, p. 314).

***Sphaeralcea Creeana* (Graham) Sprague et Sandwith**, comb. nov. *Malva Creeana* Graham in Bot. Mag. t. 3698 (1838) ; Paxt. Mag. Bot. vi. 55, cum tab. col.—Origin doubtful, possibly a hybrid, possibly a native of California.

### XXXIII. — CONTRIBUTIONS TO THE FLORA OF BURMA : VII.\* C. E. C. FISCHER.

***Fibraurea chloroleuca* Miers** [Menispermaceae].

Known from Indo-China and the Malay Peninsula and Archipelago.

Ngawun Reserve, Mergui, Feb., *R. N. Parker* 2592. "Flowers green."

\*Continued from *K.B.* 1928, p. 336.

**Garcinia rostrata Hassk.** [Guttiferae].

Known from the Malay Peninsula.

Nattalei Reserve, Mergui, 500 ft., March, *Sukoe* per C. E. Parkinson 7728. "Flowers yellowish."

**Ancistrocladus pinangianus Wall.** [Ancistrocladaceae].

Known from the Malay Peninsula.

Yaungwak klong, Mergui, Feb., R. N. Parker 2723.

**Elaeocarpus tectoniaefolius Ridl.** [Tiliaceae].

Known only from Siam

Maran, Maliwun, Mergui, 100 ft., April, *Sukoe* per C. E. Parkinson 7748. "Tree, flowers white, scented. Stem terete, grey."

**Aspidopteris floribunda Hutch.** [Malpighiaceae]

Known from Assam and China.

Bausanpan, Maliwun, Mergui, 300 ft., April, *Sukoe* per C. E. Parkinson 7755 "Woody climber; flowers white; branchlets deciduous in the hot season."

**Tetrastigma subsuberosum Planch.** [Ampelidaceae].

Known from Indo-China.

Pawut, Mergui, Jan., R. N. Parker 2515.

**Gluta coarctata Hook. f.** [Anacardiaceae].

Known from Siam and the Malay Peninsula and Archipelago.

Melechan, Maliwun, Mergui, at sea-level, flowers Dec., fruit April, *Sukoe* per C. E. Parkinson 6263, 7764. Siamese name *Maik rak* or *Mai rak*. "Middle-sized tree in thickets on banks of streams; stem grey, sending out aerial roots; flowers white to pink or brownish red"

**Castanola Wallichii Schellenb.** (*Agelaea Wallichii* Hook. f.) [Connaraceae]

Known from the Malay Peninsula.

Zimba Valley, Tavoy, Nov, R. N. Parker 2264, "Large climber in evergreen forest"

**Eriobotrya Wardii C. E. C. Fischer** [Rosaceae]; affinis *E. elliptica* Wall., foliis sessilibus obtusis nervis paucioribus praeditis, inflorescentia omnino glabra, lobis calycinis semicircularibus differt.

A spreading, deciduous tree up to 30 ft. high; twigs thick, dark-grey, glabrous, furrowed when dry. Leaves coriaceous, aggregated at the ends of the branchlets, sessile, quite glabrous, obovate, obtuse, narrowed to the base, 16-30 cm. long, 8-15 cm. wide, when dry brown or olive-green above, glaucescent below, midrib and 11-13 primary nerves impressed above, prominent below, secondary nerves subregular and almost straight between the primary. *Stipules* deciduous (not seen). *Corymbs* terminal, dense; peduncle and its branches stout, glabrous, nearly black when dry; bracts caducous, lanceolate, 7-10 mm. long, margins scarious, glabrous



without, densely white-villous within. *Flowers* numerous, 2-2.3 cm. diam., quite glabrous, "with a powerful fragrance of meadow-sweet." *Pedicels* 5-6 mm. long, rather stout. *Calyx* turbinate, 7 mm. long, lobes 5, semicircular, wider than long, a little shorter than the tube, *Petals* 5, imbricate in bud, suborbicular with a very short, broad claw, 8-10 mm. long, cream-coloured. *Stamens* numerous; filaments flattened, slightly widened at the base, a little longer than the petals; anthers small. *Disc* smooth. *Ovary* 3-5-celled; styles 3-5, shortly connate at the base, shorter than the stamens; stigmas capitate, slightly lobed; ovules 2 in each cell. *Fruit* (not seen) "indehiscent, as large as walnuts."

Namkiu Mountains. Valley of the Sheinghku, 6000-7000 ft., in flower in Oct., *F. Kingdon Ward* 7618 (type, in Herb. Kew.); Sheinghku Wang, 7000 ft., fruiting in May, *F. Kingdon Ward* 6743.

**Rhomomyrtus tomentosa** Wight [Myrtaceae].

Known from South India, China, Siam and the Malay Peninsula and Archipelago.

Bokpyin, Mergui, at sea-level, Feb., *Sukoe* per C. E. Parkinson 7647.

**Alangium Kurzii** Craib [Cornaceae].

Known from Siam.

Maliwun, Victoria Point, 100 ft., flowers March, C. E. Parkinson 2029. "Tree 70 ft. high; flowers pale-yellow."

**Hydnophytum formicarium** Jack [Rubiaceae].

Known from the S. Andaman Islands, Indo-China and the Malay Peninsula and Archipelago.

Lenya Valley, Mergui, flowers Feb., R. N. Parker 2705. "Epiphyte; roots swollen, 20 cm. thick, full of galleries occupied by ants. Common on trees near swamps and pools."

**Justicia alternifolia** C. B. Clarke [Acanthaceae].

Known from the Malay Peninsula.

Ngawun Reserve, Mergui, Feb., R. N. Parker 2620. "Shrub 4 ft. high. Flowers small, white. Common and gregarious in moist shady places."

**Phacellaria malayana** Ridl. [Santalaceae].

Known from the Malay Peninsula.

Lenya, Mergui, flowers Feb., R. N. Parker 2670. "Parasitic on *Loranthus*."

**Antidesma alatum** Hook. f. [Euphorbiaceae].

Known from Indo-China and the Malay Peninsula.

Yawngwa Range, Mergui, 1400 ft., March, R. N. Parker 2741. Fruit up to .5 in. long.

**Gelonium bifarium** Roxb. [Euphorbiaceae].

Known from the Andaman Islands and the Malay Peninsula.

Lenya, Mergui, flowers Feb., R. N. Parker 2686. "Small tree in second forest growth."

**Botryophora Kingii** *Hook. f.* [Euphorbiaceae].

Known from Siam and the Malay Peninsula.

Ngawun Reserve, Mergui, flowers and fruit Feb., *R. N. Parker* 2636. "Large shrub, leaves up to 60 × 20 cm., petioles up to 20 cm. long. Panicles pendulous, flowers reddish-purple."

**Ficus obpyramidata** *King* [Moraceae].

Known from the Malay Peninsula.

Tenasserim River, Mergui, Jan., *R. N. Parker* 2499. "Small branchy tree. Figs greenish-brown with yellow specks on thickly warted branches 10–15 cm. long from the trunk."

**Galeola altissima** *Reichb. f.* [Orchidaceae].

Known from the Malay Peninsula and Archipelago.

Klong nan kya, Mergui, fruit Feb., *R. N. Parker* 2646. "Leafless climber on a dead tree."

**Hornstedtia rubrolutea** *Ridl.* [Zingiberaceae].

Known from Siam.

Cinchona Plantations, Mergui, flowers Feb., *R. N. Parker* 2564.

"Stems 10–12 ft. high, leaves about 15 to each stem; flowers scarlet, lip edged yellow."

**Smilax leucophylla** *Bl.* [Liliaceae].

Known from Siam and the Malay Peninsula.

Lenya, Mergui, Feb., *R. N. Parker* 2661. "Large prickly climber in open scrub jungle."

**Susum malayanum** *Planch.* [Flagellariaceae].

Known from the Malay Peninsula.

Bokpyin, Mergui, flowers March, *R. N. Parker* 1750. "One metre high."

## XXXV.—MISCELLANEOUS NOTES.

It is with much pleasure that we record the following from the recent Honours List :—Dr. LEONARD COCKAYNE, Ph.D., F.R.S., received the Honour of the Companionship of The Most Distinguished Order of St. Michael and St. George; Professor Dame HELEN GWYNNE-VAUGHAN, D.B.E., LL.D., D.Sc., was promoted to be Dame Grand Cross, and Mr. E. W. DAVY, Assistant Director of Agriculture, Nyasaland Protectorate, received the Membership, of the Most Excellent Order of the British Empire.

Professor WALTER STILES, F.R.S., professor of botany in the University of Reading, has been appointed to the Mason chair of Botany at the University of Birmingham, made vacant by the death of Professor R. H. Yapp.

Mr. G. A. JONES, formerly Assistant Curator, Botanic Gardens, Dominica, has been appointed Assistant Commissioner of Agriculture for the West Indies.

We regret to record the death on the 23rd of April last, at an advanced age, of an old correspondent of Kew, Dr. LOUIS TRABUT, Professor at the University, and Director of the Government Botanical Service, of Algiers. After graduating in medicine he specialized in botany, upon which he published numerous papers dealing with various branches of the subject between 1878 and 1927. An early paper dealt with the botanical and agricultural regions of Algeria, after which he turned his attention to economic plants, including the Halfa (*Stipa tenacissima*). From 1884 to 1913 he issued, in collaboration with Dr. J. A. Battandier, a "Flore d'Alger," with an Atlas of 47 plates of plants which had not been figured elsewhere (see *Kew Bulletin*, 1914, p. 141). In 1927 he published an exhaustive paper on 'La Tlaïa' (*Tamarix articulata* Vahl), which included an account of its minute anatomy and the insect pests producing galls, which had been shown in a plate (reproduced in this paper) in P. Alpin's *Histoire naturelle de l'Egypte* in 1735. His Algerian Musci and Hepaticae were distributed in Husnot's *Exsiccatae*. In a paper in the *Journal of the Royal Horticultural Society*, xxiv. p. 250 (1900), he contends that many of the *Eucalypti* planted in the Mediterranean region have produced natural hybrids. He also investigated the origin of the cultivated oat.

C. H. W.

IMPERIAL BOTANICAL CONFERENCE, 1930.—A short Imperial Botanical Conference will be held in London immediately before the International Botanical Congress in 1930.

The Conference, which it is intended should last only one day, will meet on Friday, 15th August, at the Imperial College of Science and Technology, South Kensington.

The agenda before the Conference will be purely of a business nature. The proposal to hold a further Imperial Botanical Conference in 1935, on lines similar to that held in 1924, will be discussed, and, if necessary, the appropriate organisation for convening the Conference will be arranged. Reports of the Committees which have dealt with the Resolutions of the 1924 Conference will be received.

Any other business which it is desired to lay before the Conference should be communicated to the Hon. Secretary, Professor W. Brown, Imperial College of Science and Technology, South Kensington, London, S.W.7.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1929 ROYAL BOTANIC GARDENS, KEW

## XXXV.—DISEASES OF LIMES AND SUGAR-CANE IN THE WEST INDIES.

The following tour notes by Mr. S. F. Ashby, Mycologist of the Imperial Bureau of Mycology, are of interest in that they show how an enquiry into what was believed by the local planters to be a severe crisis in the lime industry of some of the West Indian Islands, owing to disease, led to the discovery of a gradual and largely unsuspected accumulation of disease in another important crop—sugar-cane, while allaying the alarm caused by the more obvious troubles in the lime plantations. The latter were found to be the result of exceptional climatic conditions during the past few years and not to be such as need cause permanent uneasiness. The sugar-cane disease, on the other hand, is one which, unless promptly combated, will almost inevitably result in very serious injury to this crop, though its progress is so subtle that its potentialities for harm might not have been realized until too late.

Fortunately the West Indies are exceptionally favourably situated to prevent a disastrous outbreak of the gumming disease, as they possess a wide range of otherwise desirable cane varieties that have the property of resisting the invasion of this parasite, and the prompt acceptance by planters of the advice to abandon the cultivation of the susceptible kind is a very hopeful sign that the consequences of this unfortunate development may not be serious.

E. J. BUTLER.

The visit, which extended from the middle of January to the end of March, 1929, was made at the request of the Commissioner of Agriculture for the West Indies, and was mainly for the purpose of investigating the so-called red root disease of lime cultivations in Dominica. The Commissioner had asked also for a visit to Antigua to determine if the withertip disease of limes was present in that island, and a visit to St. Lucia to examine the agricultural situation and the injury, if any, caused by plant diseases. On the outward voyage opportunity was afforded for discussing my tour with the Principal of the Imperial College of Tropical Agriculture who was attending the Inter-Island Conference at Barbados. During the three days available at Trinidad close touch was maintained with the Commissioner, who had returned from a visit to the Windward and Leeward Islands. The College was visited and interviews held with Professor Briton-Jones and other members of the staff, and

with Dr. Wardlaw, Mycologist of the Banana Research Scheme ; the low temperature plant, nearing completion, was inspected. Dr. Mason and Dr. Harland at the Cotton Research Station kindly showed me their cotton plots. The Director of Agriculture was good enough to show me the citrus varieties and crosses at the Experiment Station, St. Clair, and I spent a day with Mr. Stell, the Government Mycologist, inspecting the two areas in which witch broom disease of cacao had been discovered in 1928, and in seeing systematic control work in progress.

In the course of the voyage to Antigua I interviewed the Acting Director of Agriculture, Barbados, and met the Geneticist and Entomologist, and, at Mr. Skeete's request, inspected some young Java seedling cane plants which had been recently introduced and found them to be apparently free from disease. At St. Lucia, Dominica and Montserrat I was met by the Agricultural Superintendents of those islands. During the three days spent in Antigua, lime cultivations, maintained and abandoned, were inspected but no signs of withertip (caused by the fungus *Gloeosporium limeticolum* Claus.) were detected. It is believed that Antigua is free from this disease, so that the regulations prohibiting introduction of lime plants and fruits should be retained. At the request of the Superintendent of Agriculture for the Leeward Islands, sugar-cane plants at two estates in Antigua were inspected and symptoms of gumming disease (*Bacterium vascularum* G. Smith) were found on the widely cultivated seedling Ba 11569.

Some twenty-three days were spent in Dominica investigating the so-called red root disease of limes. The dying out of the trees had begun to be noticeable on some plantations in the coastal area towards the end of 1926, becoming gradually more widespread and more intense during the early months of 1927. The failure appears to have been at its height during that year but continued during 1928 and up to the time of my visit. The intervening storm of September, 1928, introduced a complicating factor into the situation. Losses due to the death of the trees had been serious at a few of the plantations on the Leeward Coast where production had continued to be economic in spite of the presence of withertip. Professor Briton-Jones spent some ten days investigating the disease in July, 1927 (Annual Report of the Agricultural Department, 1927-28, pp. 3-11). He recorded the failure as a complex effect due to a sum of contributing factors, among which he mentioned the storm of 1926 and the protracted wet period following it. He noted the frequent presence of *Sphaerostilbe repens* B. and Br. in the dead roots, but did not regard it as an important factor in the causation of the disease. My observations were restricted to cultivations on the Leeward and South Coastal areas where crop production was still economic.

No actively parasitic fungus was detected on the roots or other parts of lime trees dead, dying, or affected by the disease. The

fungi found—*Sphaerostilbe repens* B. and Br., *Fusarium* sp., *Phomopsis* sp., *Botryodiplodia theobromae* Pat., &c.—must be regarded as saprophytes or weak to very weak parasites on roots or aerial parts of trees dead, dying, or lowered in vitality by other causes. There is no reason to think that any of the fungi found are new to the island and it is very probable that all have been present since the cultivation of limes was begun.

The dominant cause of the dying out of seedling lime trees during the last two years appeared to be :—

- (1) The storm of July, 1926, which caused internal and external injury by strain and twisting of the shallow-rooted seedling lime trees over a considerable area, but especially in the more exposed situations.
- (2) The protracted wet weather following the storm which extended through 1927, no dry season occurring during that year.

The lack of opportunity for the soil to dry out doubtless resulted in deficient aeration and a diseased condition of the roots, promoting probable entrance into, and extension within, the tissues injured by the storm, of some weakly parasitic soil-inhabiting fungi.

*Sphaerostilbe repens* (the conspicuous rhizomorphs of this fungus in the cortex and on the wood of roots gave rise to the common name of the disease) was of very frequent occurrence on trees in differing situations (hillsides and flats) and on soils varying in character. This fungus was found on lime roots in Dominica by South in 1911 (Annual Report of the Agricultural Department, 1912-13, p. 9), and mention was made of it in association with diseased lime roots on a number of occasions in Reports of the Department during the succeeding ten years. It has been recorded frequently in association with root disease of woody crop plants in the Eastern tropics, but inoculations of roots, made with pure cultures of the fungus, notably by Brooks\* in Malaya on Hevea rubber plants in pots and in the field, and very recently by Small and Bertus† in Ceylon on wounded and unwounded sound roots of mature trees of dadaps (*Erythrina lithosperma*), Hevea rubber and tea and on seedlings of Hevea rubber and cacao, have yielded entirely negative results.

Further injury in Dominica has been done by the storm of September, 1928, and a number of trees will doubtless die in consequence during the present year, but as the dry season has been normal the severity of the disease is not likely to approach that of 1927. The isolation of spots where trees had died or were dying, by trenches, based on the assumption that an actively parasitic fungus was present capable of spreading through the soil or from the roots of affected to those of adjacent trees, has been given up as the results were negative. The exposure and removal of dead or dying

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\*Brooks, F. T. Some Diseases of Plantation Rubber in Malaya. *Ann. Appl. Biol.*, ii, No. 4, p. 217, 1916.

†Small, W. & Bertus, L. S. On the Parasitism of *Sphaerostilbe repens* B. & Br. *Ann. Royal Botan. Gard., Peradeniya*, xi, pt. 2, p. 189, 1929.

main lateral roots where trees are showing early signs of failure in single limbs is recommended for trial, as some planters claim beneficial results from such treatment, although others have had no success.

I am in agreement with Professor Briton-Jones that the budding (or grafting) of lime on sour-orange stocks (other stocks are also under trial) is the only effective remedy for avoiding immediate and deferred losses due primarily to storms. This work is being actively undertaken by the Agricultural Department and on two of the leading estates where nurseries have been established. It is very gratifying to note that Mr. Green of Roseau, the owner of Sherwood and Green Hill Estates where the cultivation of seedling limes had become uneconomic owing to withertip, has planted up on those properties the immune varieties, Tahiti, Bear's Seedless and Woglum's lime, and certain crosses with the common lime, all having been made available to him by the Agricultural Department. As he is vitally interested in overcoming withertip, the kinds mentioned will receive excellent opportunity to show their worth, and definite data in regard to the quality of the fruit may be expected this year or in 1930.

The losses caused by withertip and the so-called red root disease have fortunately been compensated temporarily by the phenomenal market value of lime oil and the consequent increased local prices for ripe limes and fresh juice. This situation should enable the estates to face the expense of planting budded or grafted limes with a view to insuring the future against storm damage.

A lecture on the root disease of limes was given before the Agricultural and Commercial Society before leaving the Island.

Gumming disease was detected on three old varieties of sugar-cane at a lime estate. Two of the varieties were Purple Transparent and Caledonia Queen (Cavengerie). It was recommended that good resistant seedling canes of recent origin (B.H.10(12), S.C.12/4, &c.), be obtained and grown by the Department for distribution.

At the urgent request of the Government of the Leeward Islands, supported by the Commissioner, I visited Antigua again early in March for three days and inspected sugar-cane on a number of estates. The Federal Department of Agriculture in cooperation with the Island Department had, during my absence in Dominica, made a survey of the distribution of gumming disease on all cultivated varieties of cane and obtained from planters a census of the acreage of each variety under cultivation. It was found that Ba 11569 was practically fully infected throughout the Island and it was doubtful if a single stool was free from it. Most of the other varieties showed slight or very slight leaf infection when growing adjacent to, or in mixed plantings with, Ba 11569. The infection on mature Ba 11569 was largely restricted to the leaves and leaf-sheaths, stalk infections appearing to be occasional and light, and no trouble due to gum in the juice had been recognised in the crop of 1928 at the Central

Factories. Ba 11569 had been found to be a valuable cane for late planting and late supplying and was tending to become rapidly one of the dominant varieties under cultivation. A lecture was given to a very representative meeting of planters at the Government Laboratory before I left ; at the meeting it was decided unanimously to stop planting the variety Ba 11569. As further observations were very desirable in regard to the behaviour of the disease, both on the mature crop and on the growing plants and ratoons destined for the crop of 1930, as well as experimental work, it was recommended that an officer, already with some experience of the disease, be appointed temporarily in the Federal Department as a Special Assistant for sugar-cane disease to undertake that work.

Montserrat was not visited as the available shipping connections would have involved a long stay which did not seem to be justified. I was able, however, in going to Antigua on both occasions, to meet the Agricultural Superintendent and a number of planters of Montserrat. Specimens of diseased lime plants submitted for examination were free from withertip and it is believed that the disease is not present in that Island. The Regulations prohibit introduction of all kinds of citrus plants and fruits. Owing to the hurricane in September, 1928, fresh fruit is scarce and cases of pellagra have occurred which medical opinion attributes to this shortage, especially of citrus fruits. Withertip of limes cannot be introduced on orange and grapefruit, as these kinds are immune from the disease. Antigua permits entrance of oranges and grapefruit as fresh fruits, and withertip does not occur there. It was recommended, therefore, that the Regulations excluding oranges and grapefruit be withdrawn, while retaining those prohibiting entry of lime plants and fruits.

During the nine days spent in St. Lucia I stayed, by kind invitation, at Government House, when not travelling, so that ample opportunity was afforded for discussing with His Honour the Administrator all matters concerning agriculture which came under my notice. Two crop seasons have now been experienced in St. Lucia under withertip conditions. In the wetter interior districts, the crop has been severely reduced or lost as in Dominica. In the northern districts, near the coast, where the rainfall is moderate, the crop has not been appreciably affected by the disease and the setting is again very promising. In the Soufrière valley the two last crops have been reduced to a quarter to a third but may continue to be economic on some plantations. In plantations on sunny hillsides slight or no effect has resulted from the disease. The nurseries for citrus, coffee, avocado, orange, papaw, pineapple, &c., at the Government property—Union—were inspected and the promising progress of nine months' work noted.

Marsh seedless and Duncan grapefruit plants on sour-orange stock obtained from Florida through the instrumentality of Professor Clark Powell were inspected at Union and at a number of estates. Most of them have grown and appear to be free from diseases.



Coconuts, extensively planted on the Windward coast, appear to be in good health. No cases of red ring disease, caused by the nematode *Aphelenchus cocophilus* Cobb, were seen and none has been suspected. This disease is present in St. Vincent and on no account should seed coconuts be brought from that Island into St. Lucia, as it is probable that the nematode is carried in the husk.

Sugar-cane was inspected at a number of estates, but no signs of gumming disease were detected on Ba 11569 and other varieties under cultivation.

It was recommended that the Agricultural Superintendent go to Dominica to examine the work of the Department there on limes and, especially, to inspect and obtain the varieties immune against withertip.

In spite of the failure to establish a banana growing industry in St. Lucia, the planters are keenly interested in the prospects of obtaining a market in Canada for other fresh fruits, especially grapefruit, oranges and avocados, and probably mangoes and pineapples, and I was able to meet the Secretary of the Fruit Producers' Association and the agent in Castries, who acknowledged valuable help received from the Agricultural Superintendent. The Government is actively fostering this tendency by obtaining and raising budded and grafted stock of the best varieties at Union.

At Barbados, *en route* for Trinidad, I made a tour of inspection of sugar-cane cultivations in company with the Acting Director of Agriculture, but saw no signs of gumming disease on Ba 11569 and other varieties in that Island.

During the two days available at Trinidad before leaving for England I visited the Usine St. Madeleine sugar estates and, in company with the Manager and the Agricultural Adviser, inspected the field plantings of Ba 11569 and other kinds, and the variety plots but did not find evidence of gumming disease.

The Curator and Botanist of the Department of Agriculture, who had just returned from a tour of inspection of the citrus industry in Florida and Porto Rico, kindly showed me the lime varieties and the crosses which he was raising at the Experiment Station, St. Clair.

Before leaving Trinidad I submitted to the Commissioner a preliminary report on my tour of the Islands.

It is a great pleasure to acknowledge the generous facilities offered by, and the kind hospitality of, their Honours the Administrators of Dominica and St. Lucia, the two Islands in which I made the longest stay, and the great helpfulness of the officers of the Agricultural Departments in all the Islands. To the Commissioner of Agriculture I am much indebted for valuable information regarding the agricultural conditions in the various Islands and for the trouble he took in arranging my itineraries.

## XXXVI.—NEW FERNS FROM TROPICAL AMERICA AND THE WEST INDIES. KAREL DOMIN.

When studying the Pteridophyta which I collected in Dominica I was in many cases obliged to make a critical revision of the forms and allied species from other islands of the West Indies as well as from Tropical America. In the following short contribution I give the descriptions of some new forms the type specimens of which are in the Herbarium of the Royal Botanic Gardens at Kew.

**Hemitelia abitaguensis** *Domin*, sp. nov. ; *H. Pittieri* Maxon, *Costae Ricæ incola*, proxime accedit et notis nonnullis speciei nostræ respondet, sed differt præter alia pinnis latioribus, segmentis apice distincte acute serrulatis, apice acutis.

Robusta, habitu *H. spectabili* var. *longipinnae* Dom. simillima, nisi profundius pinnatipartita ; secundum collectorem " filix 6-pedalis, stipite 2-3-pedali incluso, imparipinnata, pinnis 11-jugis" ; *rhachis* robusta, brunneo-straminea, quadrangularis, insuper rimoso-canaliculata, glabrescens (deciduo-furfuracea), parte superiore graciliore subacute quadrangulari glaberrima ; *pinnæ* sessiles vel subsessiles, oppositæ, in specimine nostro tantum penultimæ alternantes, mediæ, ut videtur, circiter 34-35 cm. longæ et 6.5-7 cm. latæ, late lineari-oblongæ, basin versus haud angustatæ, apice acutatæ et acumine tenui serrato terminatæ, præter apicem brevem lobatum circa 26-jugæ, ad duas trientes pinnatipartitæ, rigidiusculæ, supra obscure virides et in sicco subnitentes, subtus pallidiores, opacæ, glaberrimæ ; *costæ costulaeque* in pagina utraque prominulæ, omnino epaleaceæ ; *segmenta* subcontigua, arcuata, late falcato-lineari-oblonga, ad sinum circiter 10-12 mm. lata, apice obliquo obtusa sed imo apice acuta, latere exteriori arcuata interiore recta, margine distincte sed minute serrulata ; *venatio* utrinque sed præsertim in pagina superiore acute prominula ; costula utrinque venis circiter 12 a basi ipsa bifidis vel sæpiissime duplo bifurcatis instructa ; venæ infimæ, e basi costulae egredientes, liberae, haud anastomosantes sed arcuatæ et in sinum progredientes ; *sori* uniseriati, minusculi, exacte inter marginem et costulam intermediï ; sororum series segmentorum apicem haud attingentes, sed inferne arcuato-conjunctæ, a costa attamen 3-4 mm. distantes ; *indusia* membranacea, in circuitu semicircularia, præter marginem pallidum fusco-brunnea, biloba ; *receptaculum* cylindrico-globosum, sub lente setuloso-granulosum.

Habitat in Andibus Ecuadorensibus in monte Abitagua, October 1857, *Spruce* 5364.

**Hemitelia quiltensis** *Domin*, sp. nov. ; species in subgenere *Cnemidaria* notabilis et cum nulla alia confundenda. Præter pinnarum formam areolis depressis et præsertim costis paleaceis sorisque costulis approximatis et costas fere tangentibus insignis.

*Caudex* et *stipes* desunt, sed *stipes* e collectore quadripedalis spinosa ; *rhachis* robusta subteres, furfuraceo-tomentella sed ob

indumentum deterstile pro parte glabrescens; frons pinnata, sed in specimine nostro tantum pars verisimiliter media quadrijuga adest; *pinnae* oppositae sessiles, 7–8 cm. invicem distantes, subrigidiusculae, glaberrimae, late lingulato-lineari-oblongae, basi rotundatae, apice parum angustatae et serrato-acuminatae, multi-jugae, jugis (supremis coalitis additis) saltem 40, circiter 33 cm. longae et 5.5–6 cm. latae, infra medium pinnatipartitae, parte quinta superiore tantum crenato-lobulatae, eodem colore atque eae *H. spectabilis*; *costa* in pagina superiore paleis sat numerosis magnis latisque, ovatis vel ovato-lanceolatis, margine suberosis, distincte acuminatis, glabris, circiter 15 mm. longis et basi usque 5 mm. latis, instructa, sed insuper epaleacea, glabra; *costulae* infra paleis similibus sed multo minoribus hinc inde vestitae, plerumque epaleaceae; *pinnulae* alternantes, mediae circiter 25 mm. longae et ad sinum circiter 8 mm. latae, contiguae, sinubus angustissimis separatae; *segmenta* oblongo-obovata, parum falcata, obtusissima, apice conspicue serrato-dentata, lateribus integra; *venatio* tenuis sed praecipue in pagina superiore acute prominula; venae utrinque 12–13, basi bifurcatae, ramo superiore recto, inferiore arcuato; venulae infimae anastomosantes et areolas costales humillimas, tantum circiter 1 mm. altas efformantes; *sori* mediocres vel minusculi, densi, uniseriati, ad venulas furcatis inserti; sororum series a margine remotae et costulae approximatae, ad costam arcuatim connectae et costam fere attingentes.

Habitat in Ecuador in Andibus Quitensibus ad fl. Peripa prope Mig, ubi hanc plantam *P. Sodiro* anno 1875 collegit et nomine *H. grandifoliae* designavit.

***Hemitelia roraimensis*** *Domin*, sp. nov.; species notabilis et facile distinguenda. *H. subincisa* jam pinnis basi cuneatis, venatione et sororum dispositione discrepat. Species nostra cum *H. mexicana*, *H. lucida* et *H. guatemalensi* comparanda est (cf. Maxon), sed ab omnibus sat superque distincta. *H. spectabilis* venulis numerosis furcatis necnon sororum dispositione primo aspectu separanda est.

*Caudex* et *stipes* desunt; *frons* late triangulari-ovata, pinnata, 10-juga, 65 cm. longa; *rhachis* glabra, epaleacea, subquadrangularis, lateribus profunde rimosa, brunnescens, insuper gracilior; *pinnae* oppositae, rarius suboppositae, lineari-lanceolatae, sensim acuminatae, basi latissimae et truncatae, lateribus rectis, lobulo ultimo inferiore paulum auriculato-provecto, omnes sessiles et colore cum iis *H. spectabilis* congruentes, subrigidiusculae, glaberrimae; *pinnae infimae* (longissimae) circiter 22 cm. longae et 3 cm. latae uti superiores (supremis exceptis) tantum pinnato-lobulatae; lobuli maximi quadrantem usque trientem pinnae dimidii attingentes, longitudine sua conspicue latiores (basi circiter 7 mm. latae sed tantum 4–5 mm. longae), inaequilaterales (falcatae), apice obtusissimae sed ad lateris superioris apicem subacutae, integrae vel subintegrae, marginibus minute revolutae; *pinnae superiores* sensim paulo diminuentes et

minus profunde lobatae ; pinnae *supremae* circiter 13 cm. longae, tantum lobatae ; segmentum terminale ovato-lanceolatum, acuminatum, 18 cm. longum et basi 8 cm. latum, inferne pinnatipartitum (segmentis obtusissimis), dein lobatum et crenatum ; *costa* penninervia, venis (costulis) utrinque circiter 23-25 instructa ; *costulae* rectae, tantum apice incurvae, utrinque venas circiter 4 semper simplices emittentes ; *venae* infimae anastomosantes et areolas costales triangulares sat altas efformantes ; *venulae* ipsae ad sinum egredientes ibique haud inter se sed plerumque cum venis superpositis conjunctae ; *sori* minusculi haud numerosi, ad venas instructi, uniseriati ; series sororum inter costulam et marginem intermedia vel margini aliquantum propius accedens, in lobulo arcuato-contigua sed etiam versus costam connexa sed a costa valde (circiter 5 mm.) remota.

Habitat in British Guiana : Roraima, 1863/64, *C. F. Appun* 1127, a cl. J. G. Baker pro *H. subincisa* Kze. declarata (" Type specimen of Martius Flora Brasiliensis ").

Praeter formam supra descriptam, specimina sequentia ad speciem nostram referenda vidi :

(1) British Guiana : Kwating Creek, 1863/67, *C. F. Appun* 1035. Forma ut videtur multo robustior, *pinnis* profunde pinnatilobis, *venis* lateralibus plus numerosis (circiter 6), infimis supra areolam costalem triangularem duas areolas angustas rectangulares efformantibus.

(2) Roraima Range, 3500 ft. alt., Mount Roraima Expedition, 1898, *F. V. McConnell* and *J. J. Quelch* 620.

A typo recedens tantum *statura* multo robustiore *lobis* parum incisus et propterea *pinnis* tantum obtuse serrato-lobulatis.

***Alsophila submarginalis* Domin**, sp. nov. ; species ab *A. praecincta*, quacum erat confusa, toto caelo abhorrens et jam pinnis profunde pinnatisectis facillime dignoscenda. Sororum seriebus submarginalibus, pinnis levissime subcordatis notisque aliis paucis (praesertim venatione) cum *A. praecincta* comparanda, sed praeter pinnarum divisionem pinnulis late lineari-oblongis, segmentis fere rectis, obtusissimis, perlatis, contiguis, facile separanda.

*Caudex* et *stipites* desunt ; *frons* bipinnata, rigidiuscula, minus discolor quam in *A. praecincta* ; *rhachis* laevis, brunnescens ; *pinnulae* densae, subcontiguae, sessiles, sed ob segmenta manifeste alternantia basi valde inaequales, truncatae vel leviter subcordatae, majores in specimine nostro 10-12 cm. longae et 2.5-2.75 cm. latae, late oblongo-lineares, apice triangulari brevius acuminatae, praeter apicem pinnatilobum circiter 13-jugae, profunde pinnatisectae, basi articulae ; *costae* et *costulae* hinc inde sed praesertim subtus paleolis parvulis albidis scariosis, ovatis usque lanceolatis et acuminatis instructae sed praeterea omnino glabrae ; *segmenta* densa, subcontigua vel contigua et propterea pinnulas quasi continuas efformantia, oblonga, valde lata, obtusissima, circiter 13 mm. longa et 6 mm. lata, fere recta, toto margine distanter minute

subserrulato-denticulata; venatio tenuiter prominula sed vix colorata; *venae* pinnularum sterilium utrinque circiter 6 (5-7), plurimae paulo infra medium bifurcatae, nonnullae interdum trifurcatae; *venulae* pinnularum fertilium plerumque simplices; *sori* utroque latere 3-5, submarginales, infimi arcte ad sinum positi.

Habitat in Brasilia: *Martii* Herbar. Florae Brasil. 391 (" *A. praecincta* Kunze").

***Alsophila dryopteroides* Domin**, sp. nov.; species notis nonnullis in affinitatem *A. praecinctae* spectans, sed ab hac jam soris intermediis (nec marginalibus) diversa. *A. leucolepis* paleis et pinnulis profundius incisis facile dignoscitur.

*Caudex* et *stipites* desunt; *frons* bipinnata, pinnulis pinnatifidis; *rhachis communis* robusta, subteres, laevis, pallida, obtuse sulcata, inermis; *pinnae* sessiles alternae, elongato-lanceolatae, acuminatae, in specimine nostro pinna unica fere semimetralis 18 cm. lata, 18-juga, apice pinnatifido dein lobato instructa; *rhachis specialis* stramineo-brunnescens, pallida, subangulata, glabra laevisque; *pinnulae* sessiles, alternae, lineari-lanceolatae, sensim longe acuminatae, basi aliquantum inaequali cuneato-truncatae, longissimae 9 cm. longae et basi qua latissime patent 15-16 mm. latae, parum discolores et utrinque opacae (nec nitidae), rigidiusculae sed haud coriaceae, fere ad medium (tantum ima basi profundius) pectinato-pinnatifidae, dein pinnatilobae et acumine tenui sat longo tantum crenulatae, margine revolutae, supra glabrae, subtus ad costam et costulas *paleolis* albidulis scariosis parvulis vesiciformibus sat crebre obsitae et in pagina ipsa minutissime punctulatae; *segmenta* (lobique) recta, divaricata, lineari-oblongo-triangularia, obtusissima et ob marginem revolutum quasi subintegra, sed re vera minute distanter crenulata; *venae* pinnularum fertilium utroque latere tantum circiter 5, rectae, aliae imo apice furcatae, aliae simplices soriferae; *sori* inter marginem et costulam fere medii, sed ob marginem revolutum aliquando margini quasi approximati, in utroque latere 4-5, mediocres, segmentorum apicem fere attingentes, infimi inter sinum et costam intermedii; receptacula globosa, echinata.

Habitat in Brasilia in sylvis antiquis ad Gongosoco provinciae Minas Geraes, *Gardner* 5331 (J. G. Baker ut *A. leucolepis* Mart.).

***Alsophila polyphlebia* Domin**, sp. nov.; *A. leucolepidi* affinis, sed ob paleas basales ignotas aliquantum dubia. Ab *A. leucolepide* differt colore, textura herbacea, segmentis majoribus planis divaricatis, paleolis majoribus ut videtur deficientibus, et praesertim venis plurifurcis, soris costulae approximatis et receptaculo longe crinito.

*Rhachis* communis sparse spinuloso-muricata; *frons* herbacea, supra fusco-viridis, subtus opaca (nec laete viridis); *pinnulae infimae* brevissime petiolulatae, usque 11 cm. longae et 1½ cm. latae, *superiores* subsessiles, oblongo-lineares, breviter acuminatae, ad

duas trientes fere ad rhachin pinnatisectae; *costa* supra adpresse striguloso-hirta, infra pilosula et tantum *paleolis* perraris bullatis parvis acuminatis albidulis instructa; *segmenta* fere ad rhachin pinnatisecta, fere angulo recto patentia, lineari-oblonga, grosse dentato-serrata, recta, obtusissima, praeter *costulam* minute puberulam et magis minusve paleolatam utrinque glabra; *venae* utroque latere circiter 6–9, supra basin trifurcatae vel in ramos 4 (5) divisae, rarissime hinc inde vena simplici interjecta; *sori* in utroque latere circiter 5–6, ad furcam primam vel superiorem insidentes, in vena infima saepe bini; sororum series costulae quam margini propius accedentes; *receptaculum* pilis longis densis hyalinis articulatis flexuosis crinitum.

Ihios Brasiliae, *Moricand* (Baker in Mart. Fl. Bras. sub nomine *A. phaleratae* var. *alutaceae*).

**Diplazium Bakerianum** Domin, sp. nov.—*Asplenium Shepherdii* var. *costaricense* Bak. in Journ. Bot. xxv. 25 (1887), nec *Diplazium costaricense* C. Chr.

Excellit *fronde* elongato-oblonga, rigida, apice attenuato in pinnulas (*segmenta*) parvas elliptico-rhomboidales pinnatisecta et demum tantum acumine serrato caudata; frons tota distincte pinnata, circiter 14–20-juga; *pinnae* breviter sed distincte petiolulatae, e basi quam maxime inaequali anguste cuspidatae, i.e. sensim sensimque lineari-lanceolatae et tenuiter longe acuminatae, ima basi infra manifeste horizontaliter truncatae, sed latere superiore segmento distincto majusculo erecto rhomboidali instructae, praeterea tantum parte infima utrinque in lobos 1–2 pinnatifidae et insuper tantum crenatae et acumine subintegro terminatae; *sori* simplices lineares, recti vel obliqui, secundum pinnarum costam biseriati, sed praeterea etiam segmento basali superiore sorifero.

Habitat in Costa Rica, J. J. Cooper.

**Dryopteris (Lastrea) Harcourtii** Domin, sp. nov.; species habitu phegopterideo tenerimo haud singularis, sed characteribus, ut videtur, satis distincta, *D. Nockianae* (Jenm.) C. Chr., cujus specimen jamaicense a cl. *Sherring* anno 1886 collectum examinavi, forsan proxime affinis, sed differt paleis, statura robustiore, pinnis distantibus, segmentis obliquis et venis plurijugis. *D. oligocarpa* O. Ktze. notis nonnullis speciem nostram revocat, sed differt inter alia paleis minute pubescentibus, indumento, laciniis subrectis haud linearibus, venis 6–8-jugis, indusiis pubescentibus.

*Rhizoma* crassum, erectum, breve, caespitosum, radices rufo-tomentosas emittens, apice *paleis* fusciscentibus, latis, ovatis, acuminatis, glabris, lucidulis, circiter 5 mm. longis vestitum; *frondes* graciles, erectae, elongatae, usque plus quam 6 dm. longae, primo aspectu longe stipitatae, sed re vera stipite spurio (rhachi pinnae redactas minutas usque minutissimas gerente) instructae; *stipes* verus brevis, ima basi excepta pallidus (stramineus), obtuse compresso-quadrangulus et antice bisulcatus, glabrescens (vel

minute puberulus) sed hinc inde paleis instructus; *rhachis* gracillima, straminea, glabrescens (re vera dense sed minutissime glanduloso-puberula), antice bisulcata, postice teres; *lamina* utrinque laete viridis, tenuiter membranacea, pellucida, praeter glandulas fere omnino glabra, pinnis infimis minutis neglectis circiter 30–35 cm. longa et 11–13 cm. lata, lanceolato-elliptica vel lanceolato-oblonga, acuminata, basin versus gradatim sed breviuscule decrescens et sat abrupte in pinnas parvulas, porro minutissimas, valde distantes et basin versus alternantes abiens; *pinnae* diminutae frondis in specimine maximae utroque latere quinque, secus tractum 14 cm. longum dispositae, summae maximae 1 cm. longae, sed infimae ad auriculum pinnatifidum vix 1 mm. longum restrictae, in frondibus ceteris minoribus, frondis parte basali typo primo cl. C. Christensen bene respondentibus, tantum 2–3; pinnae omnes sessiles, plerumque alternae sed in fronde maxima omnes oppositae vel suboppositae, patentissimae, utroque latere numerosae (17–20) sed semper interstitiis liberis separatae, lineari-oblongae vel lanceolato-oblongae, acuminatae et saepe parte superiore plus minusve falcatae, aequilaterales, maximae circiter 6–7.5 cm. longae et circiter 13–14 mm. latae, fere ad costam ipsam pinnatisectae, summae in spicam lanceolatam, distincte acuminatam pinnatisectam, porro pinnatifidam desinentes; *segmenta* numerosa sed sinubus apertis angustis separata, linearia, 8–10 mm. longa, sed tantum circiter 2 mm. lata, obtusa, falcato-incurva, margine crenulata sed ob marginem saepe paulisper revolutum quasi integra, pellucide punctata, basalia haud producta, omnia insuper praeter *costam* minute breviter pilosulam glabra, subtus glabra (tantum sub lente ad costas minutissime adpresse pilosula), sed sub lente *glandulis* sessilibus globularibus aureis lucidis pulcherrime crebre inspersa; *venae* 8–12-jugae; *sori* parvi, e sporangiis haud numerosis glabris compositi, ad apicem venarum inferiorum circiter 4 inserti (itaque submarginales), juvenute indusio ut videtur glabro instructi.

Habitat in sylvis antiquis insulae Dominicae haud procul ab oppido Roseau, 1926, *K. Domin.*

**Pityrogramma subnivalis** *Domin*, sp. nov.; species certe insignis, rhizomate prorepente, habitu singulari, rhachi pallida, pinnis brevibus erectis, pinnulis crasse coriaceis, marginibus quam maxime revolutis, subtus sulphureo-farinosus, sed stipitibus ad basin albo-furfuraceis, inter alia notabilis. Ad *P. Ornithopteris* (Klotzch) Dom. proxime accedit, sed ab hac jam rhizomate, frondibus perangustis, pinnis brevibus erectis, indumenti farinosi colore sat superque distat.

Perennis, *rhizomate* crasso, elongato, oblique prorepente et ad apicem valde incrassatum caespites densos efformante, *paleis* fuscis, nitidis, lanceolatis, tenuiter acuminatis (sed acuminibus saepe delapsis) dense vestito; *frondes* erectae, e rhizomate plurimae, circiter 4 dm. longae, longe stipitatae; *stipites* frondibus longiores, raro tantum frondes aequantes, e basi arcuata erecti, interdum

subflexuosi, sat robusti, rigidi, epaleacei vel tantum ima basi paleis rigidioribus fuscis (nec ferrugineis) instructi, ceterum glaberrimi, sed parte basali distincte albo-furfuracei, praeterea efarinosi vel interdum medio vel insuper sulphureo-farinosi, ad medium vel fere ad apicem dilute purpurei, opaci (nec lucidi), insuper interdum pallide gilvi; *frondes* angustae, lanceolato-lineares, e basi latissima sensim decrescentes, crasse coriaceae, rigidae, glabrae, bipinnatae; *pinnae* erectae, lanceolatae, sat numerosae, inferiores distantes, infimae circiter 5 cm. (usque 7 cm.), mediae circiter 3 cm. longae; *rhachis* semper pallida (e gilva pallide fuscens), primo sulphureo-farinoso, postremo denudata; *pinnulae* divaricatae, subtus pulchre sulphureo-farinosae, sat densae, indivisae, lineares vel lanceolato-lineares, perangustae, mediae circiter 5–8 mm. longae et 1.5 mm. latae, obtusae, valde coriaceae et in siccitate ob nervos in pagina superiore valde impressos rugosae, marginibus valde revolutis paginam inferiorem saepe totam obtinentibus, infimae pinnae cujusque longiores, sequentes gradatim decrescentes, valde distantes et quasi pectinatae, pinna terminali semper longiore et plus minusve lobulata.

Colombia: Sierra Nevada, Sta. Marta, 1884, *Purdie* ("near the snow, which may account for its peculiarly curled and rigid appearance").

**Pityrogramma austroamericana** *Domin*, sp. nov.; species distincta, notis nonnullis *P. caribaeae* Dom. revocans, sed ab hac jam pinnulis acutis diversa. *P. calomelanos* (Sw.) Link jam indumento albo, pinnulis pinnatifidis acuminatis, *P. chrysophylla* (L.) Link pinnulis obtusis facile dignoscitur.

Caespitosa, *rhizomate* abbreviato, crasso, *paleis* angustis, e basi latiore anguste lanceolatis, longe et tenuiter acuminatis, ferrugineo-brunnescentibus vel ex parte nigricantibus, subnitidis dense vestitis; *stipites* plerumque graciles, atropurpurei vel atrofusci, nitidi, glabri, nisi ima basi paleis caducis haud copiosis instructi plerumque nudi, raro basi paulisper aureo-furfuracei, laminas circiter subaequantes vel iis breviores, raro longiores; *frondes* lanceolato-deltoidaeae usque fere deltoideae, tantum breviter acuminatae, apicem versus sensim decrescentes, bipinnatae, superne tantum pinnatae, pinnis pinnatifidis usque simplicibus circiter 13–23 cm. longae et basi 8–11 cm. latae; *rhachis communis* fusco-purpurea, *rhachides speciales* plerumque pallidae et semper opacae; *pinnae* breviter petiolulatae vel subsessiles, lanceolatae usque lineari-lanceolatae, acuminatae sed imo apice obtusiusculae, subcoriaceae, substrictae, infimae circiter 6 cm. longae et basi 2–2.5 cm. latae, inferiores et mediae plerumque divaricatae, superiores erecto-patentes, ad frondis medium paulo diminuentes sed porro in formam angustam et postremo in pinnas elongato-lineares, basi superiore lobulo acutiusculo auctas desinentes; *pinnulae* rectae, sat densae, sed semper inter se spatio libero separatae, angulo acuto (circiter 45°) patentes, lineari-lanceolatae, apicem versus



angustatae, acutae vel subacutae, ob margines breviter revolutos quasi integerrimae, inferiores circiter 1 cm. longae et medio vix 2 mm. latae, omnes indivisae, basales pinnae cujusque haud elongatae sed plerumque utroque latere basi lobulo uno acuto praeditae, ceterae basi superiore in angulum subacutum provectae, lateribus rectae, omnes subtus indumento aureo persistente pulchre farinosae.

Brasilia : Rio de Janeiro, 1878, *Miers* 51 ; Cubatai, Theresopolis, 1869, *Fritz Mueller* 253 ; St. Catherina, *Fritz Mueller* 15 ; sine loco speciali, *Gardner* 12. Bolivia : Prov. Larecaja ; Challapampa, ad rivum in scopulosis, 2550-2700 m., 1860, *G. Mandon* 1549 bis ; Yungas, *A. Miguel Bang* 244. Paraguay : *E. Hassler* 1397.

### XXXVII.—A NEW *MICHELIA* FROM THE BORDERS OF TIBET AND ASSAM. J. E. DANDY.

The new species of *Michelia* described below was collected by Captain F. Kingdon Ward during 1928 in the region of the Mishmi Hills, on the borders of south-eastern Tibet and the Lakhimpur District of Assam. His material consists of sterile branches accompanied by flowers which were picked up from the ground. In affinity the plant comes nearest to *M. doltsope* Buch.-Ham. (including *M. excelsa* (Wall.) Bl. and *M. manipurensis* Watt)\*, a widespread species which was met with in the not far distant Seinghku valley by Ward himself (n. 7629) in 1926. From *M. doltsope* the new species differs chiefly in the indumentum of the stipules, spathoid bracts, and peduncles being greyish instead of rufous or tawny, and in the lamina of the leaves being narrower in shape and lacking the rufous or tawny indumentum of the lower surface which is so characteristic of the earlier known species.

***Michelia Wardii* Dandy**, sp. nov. [*Magnoliaceae-Magnolieae*] ; ex affinitate *M. doltsope* Buch.-Ham. sed indumento griseo et foliorum lamina forma angustiore inter alia differt.

*Arbor* magna ; indumentum griseum ; ramuli glabri vel juniores ad nodos pubescentes. *Foliorum* lamina oblanceolata vel anguste oblonga vel anguste elliptico-oblonga, basi attenuata in petiolum decurrens, apice acuminata vel interdum acuta, usque ad c. 16 cm. longa et 4 cm. lata, chartacea, supra glabra, subtus glaucescens glabra vel in costa praesertim apicem versus parce appresso-pubescent, nervis lateralibus utrinsecus c. 9-14 subtus conspicuis ; petiolus gracilis, usque ad c. 1.5 cm. longus, glaber vel juvenilis basin versus appresso-pubescent, infra vel ad medium cicatrice stipulari notatus ; stipulae petioli parti inferiori adnatae, extus appresso-tomentosae vel - pubescentes. *Alabastrum* primo in bracteis spathoideis 3 extus dense sericeo-tomentosis deinceps deciduis inclusum ; pedunculus percrassus, c. 0.5-0.7 cm. longus,

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\*See Dandy in Journ. of Bot. lxx : 277-279 (1927).

dense tomentosus. *Perianthii* tepala c. 9-12, subsimilia sed interiora minora, crenea, exteriora obovata- vel oblanceolato-oblonga c. 4.5-6.5 cm. longa extus ad basin pubescentia. *Stamina* c. 10-15 mm. longa; connectivum ultra antherae loculos in appendicem brevem brevissimamve acutam productum. *Gynaecium* saltem juvenile appresso-pubescent, stipite excluso subcylindricum; carpella numerosa; ovula c. 4.

Chibaon Delei valley, 28°10'N., 96°30'E., 2100-2400 m., 12 April 1928, *F. Kingdon Ward* 8060 (type in Herb. Kew).

Ward's field-notes run: "Michelia. A big tree, with large bole and spreading crown, rather ragged and semi-leafless. Flowers cream. In the mixed forest along the ridge. Flowers and fruit picked up. (Collected in the Seinghku valley 1926)." The last remark no doubt refers to his n. 7629, collected in the valley of the Seinghku at lat. 28°5'N. and long. 97°30'E. in 1926, and consisting of picked-up fruits which, from the indumentum of the peduncles, are not *M. Wardii* but *M. doltsopa*.

I am indebted to the Director of the Royal Botanic Gardens for the loan of the material concerned.

### XXXVIII.—ON THE FLORA OF THE NEARER EAST: IV.\* W. B. TURRILL.

***Delphinium acutilobum* Turrill**, sp. nov.; ab *D. thirkeano* Boiss. petali lobis mediis divaricatis elongato-triangularibus subacutis recedit.

*Herba* erecta, caulibus rigidis divaricatis ramosissimis inferne adpresse et breviter hirtis superne patule denseque velutinis glandulosis, ramulis ultimis unifloris plus minusve 2 cm. longis. *Folia* palmatim multipartita, adpresse puberula, laciniis linearibus vel oblanceolato-linearibus. *Bracteae* saepissime integrae, lanceolatae, acutae, 2-3 mm. longae, hispidulae; bracteolae bracteis similes sed minores, a flore remotae. *Sepala abaxialia lateraliaque* oblonga, apice rotundata, 7 mm. longa, 2-3 mm. lata, 5-6 nervis gracilibus viridibus hispidulis instructa. *Sepalum adaxiale* saccatum extra hirsutum. "*Petalum*" calcaratum, calcari apice clavato circinato-involuto, quinquelobatum, lobo superiore leviter retuso apice caeruleo, mediis divaricatis elongato-triangularibus subacutis, inferioribus membranaceis elongato-rotundatis, omnino 1.5 mm. longum, glabrum. *Stamina* inaequalia, filamentis obspathulatis leviter pubescentibus. *Carpellum* unicum, glabrum, vix 3 mm. longum, vix compressum. *Folliculus* subcompressus, oblongo-obovoideus, basi attenuatus, apice abrupte rostratus, 1.1 cm. longus, glaber, nitens; semina squamis longiusculis distinctis densissime obtectis.

N. Persia: Near Yam, Tabriz district, 21st Aug. 1927, *Gilliat-Smith* 2086.

\*Continued from *K.B.* 1927, p. 14.

The extremely interesting group (Sect. *Consolida*, Tribus *Involuta*) to which this species belongs contains a very limited number of known species, all of them with an oriental distribution. All except one of these are now represented at Kew, and since the group is rather a critical one it will be well to compare our new species with each of those previously known.

*D. aconiti* L., the earliest described, is separated by its long slender fruits which, when mature, attain a length of 2.2 to 2.5 cm., including the beak. The indumentum of the upper parts of the stems and branches resembles that in our plant. The known distribution is limited to a small area on both sides of the Dardanelles (see *Kew Bull.* 1924, 306). *D. thirkeanum* Boiss. is separable chiefly by the shape of the so-called petal lobes, the intermediate ones being obtuse and approximately equal in length to the adaxial, which is two-lobed. The abaxial lobes are shorter and broader than in our plant. The indumentum of the stem is similar. This species is apparently limited to Asia Minor. *D. hohenackeri* Boiss. is distinguished by the reduced indumentum of the stem, this indeed being often glabrescent, and the more slender branching. The lobing of the petal shows some range of variation but is very like that in *D. thirkeanum*. The distribution is from Asia Minor (Cappadocia) eastwards to Transcaucasia and Persia, as far south-east as Ispahan. Its area thus includes that of our new species and indeed Bornmüller records it from "Urumia, ad Ser" in Verh. Zool.-Bot.-Ges. lx. 69 (1910). I have not seen the specimen named by Bornmüller, and it is possible it has been wrongly determined. *D. anthoroideum* Boiss. has an adpressed or sparse spreading indumentum. The lobing of the petal is apparently not quite the same in all specimens referred to this species by Huth in Engl. Bot. Jahrb. xx. 366 (1895) and often resembles that in our species. It is distributed from Asia Minor and Armenia to Syria and Iraq. *D. saccatum* Huth is distinguished from our species and all other species of this group by the petal spur not being circinate. It is known only from Mardin, near Richemil, in Kurdistan. *D. teheranicum* Boiss. from near Teheran in Persia has the petal minutely crenulate at the apex, not lobed. Its affinity with the other members of the *Involuta* is doubtful.

***Dianthus tenuicaulis* Turrill**, sp. nov.; a *D. androsaceo* Hayek caulibus elongatis tenuibus distinguitur; a *D. pinifolio* S. et S. calycibus minoribus squamis brevioribus recedit.

*Planta* caespitosa, partibus inferioribus suffrutescentibus. *Caules* erecti, graciles, usque ad 3 dm. alti, 0.75–1.5 mm. diametro, simplices, glabri. *Folia* anguste linearia, apicem versus gradatim attenuata, 1.6 cm. longa, 1 mm. lata, rigida vel subrigida, margine costaeque serrulata, trinervia, nervis lateralibus obscuris. *Capitula* 1–4-flora, squamis involucri et calycinis circiter 8 oblongo-obovatis in aristam usque ad 3.5 mm. longam calyce brevioribus subito attenuatis stramineis plus minusve atropurpureo-suffusis. *Calyx* cylindricus, 1 cm. longus, 2 mm. diametro, atropurpureus in parte

superiore praecipue, dentibus elongato-triangularibus acuminatis 4 mm. longis instructus. *Petala* 1.6 cm. longa, purpurea, lamina 0.7 cm. longa basi gradatim cuneata apicem versus dentibus 4 grossis (2 lateralibus, 2 apicalibus) instructa. *Filamenta* 1.2 cm. longa; antherae 1.5 mm. longae. *Capsula* non vidi.

Bulgaria: south-central Rodopes, Daridere district, towards Boju, circiter 800 m., 17th July 1926, growing in clefts of metamorphic rocks, *Turrill* 1383.

***Silene delectabilis* Turrill**, sp. nov.; a *S. argaea* Fisch. et Mey. (in Ann. Sci. Nat. 1854, 36) foliis latioribus calycibus densissime glanduloso-pubescentibus distincta.

*Planta* perennis, compacta, nana, florifera; rami dense caespitosi, breves, floribus inclusis 4–6 cm. longi, foliacei, saepissime uniflori. *Folia* linearia, vel lineari-lanceolata, ad apicem acutum vel subacutum angustata, circiter 1 cm. longa, 1–2 mm. lata, plana vel leviter triangulari-subulata, margine ciliata (interdum densissime), pagina superiore dense tomentoso-puberula, inferiore glabra vel subglabra. *Calyx* anguste cylindrico-clavatus, 3 cm. longus, purpureo-ruber, glanduloso-pubescent, venosus, dentibus oblongis obtusis 3 mm. longis vix 2 mm. latis, fructiferus leviter subinflatus. *Petala* breviter bilobata, 1.4 cm. longa, 4 mm. lata, intense purpureo-rubra, corollae laciniis vix 0.75 mm. longis oblique retusis, laminae basi sinu rotundato. *Ovarium* oblongum, 4 mm. altum, 1.5 mm. diametro. *Capsula* ovoideo-oblonga, 5 mm. alta, 5 mm. diametro, carpophoro 2.6 cm. longo. *Semina* tuberculato-reticulata, pallide brunnea.

N. Persia: near the top of Mishou Dagh, in cracks in the rocks, with very showy deep pink-purple flowers, 19th July 1928, *Gilliat-Smith* 2359.

This species is evidently a very attractive plant in the living state. It belongs to the section *Auriculatae* as defined by Boissier [Flora Orientalis i, 572 (1867)]. The name of the section is not very appropriate, since some of the species, including that now described, have petals no more auriculate than those of the next section, *Inflatae*, in Boissier's arrangement. The species described above has been placed near *S. argaea* Fisch. et Mey., which is known from Mt. Argaeus in Cappadocia and is, like ours, a mountain plant flowering in the summer. The leaves in the aggregate are much broader, the calyx is more densely glandular-pubescent, and the carpophore is longer in the Persian plant than in *S. argaea*.

***Minuartia acuminata* Turrill**, sp. nov.; a *M. dianthifolia* (Boiss.) Hand.-Mazz. habitu dense caespitosa, foliis caulinis acutioribus, sepalis acuminatis recedit.

*Herba* perennis, dense caespitosa, caulibus numerosis erectis ad 1.5 dm. altis subquadrangularibus inferne glabris superne glanduloso-hirtis. *Folia* basalia lanceolato-linearia, acuta, 1.3 cm. longa, 1.5 cm. lata, glabra, rigida, in paribus basi 1 mm. longa vaginata

connatis ; caulina anguste lanceolato-linearia, acuta vel acuminata, 8-12 mm. longa, margine inferne praecipue plus minusve membranaceo-vaginata. *Inflorescentia* terminalis, 1-5-flora ; pedicelli usque ad 1 cm. longi, glanduloso-hirti. *Sepala* lanceolata, acuminata, 8 mm. longa, 1.5 mm. lata, margine membranacea, circiter 8-nervia, extra glanduloso-hirta. *Petala* oblongo-lanceolata, obtusa, 6 mm. longa, 2-2.5 mm. lata, alba, nervis gracilibus circiter 7 praedita. *Stamina* fere 5 mm. longa. *Ovarium* 2 mm. altum, 1.5 mm. diametro, glabrum, stylis glabris 3 mm. longis.

N. Persia : Mishou Dagh, 19th July 1928, *Gilliat-Smith* 2374.

This interesting and, for its genus, handsome plant is a distinct species linking in some respects the subsections *Dianthifoliae* and *Graminifoliae* of Mattfeld [Fedde Repert. Beih. xv. 130 (1922)]. It has the densely caespitose habit of the latter subsection, but the sepals are longer than the petals. There is a gradual transition from the lower cauline leaves to the bracts, the latter being shorter and with a broader membranaceous margin than the former. The stems are obscurely quadrangular.

***Linum mucronatum* Bertol. var. *eglandulosum* Turrill, var. nov.** ; a planta vulgare foliis basi utrinque haud glanduloso-unistipulatis.

N. Persia : near Tabriz, May 1926, *Gilliat-Smith* 1586.

The original description and the specimens in the Herbarium at Kew indicate that *L. mucronatum* Bertol. is usually provided with well-marked stipules in the form of sessile or almost sessile glands which are brownish-black in the dried condition. In the material from Tabriz supplied by Gilliat-Smith these glandular stipules are obsolete or represented by the merest vestiges. Boissier [Flora Orientalis i. 855 (1867)] uses the name *L. orientale* as a new combination for *L. flavum* var. *orientale* L. and sinks *L. mucronatum* as a synonym. Since Bertoloni's name dates from 1842 this procedure is not in agreement with modern rules. It is also doubtful if all the specimens quoted by Boissier are conspecific.

***Astragalus* (§*Brachycalyx*) *constrictus* Turrill, sp. nov.** ; ab *A. eriostylo* Boiss. et Hausskn. ramis longioribus, calycis dentibus triangularibus, vexillo ovato-oblongo supra medium constricto, stylo glabro recedit.

*Frutex* ad 2.3 dm. altus, ramosus, spinosus. *Rami* ad 8 cm. longi, patentes, densissime albo-tomentosi, dense foliati. *Folia* circiter 2 cm. longa, foliolis oblongis 4-6-jugis approximatis 3-4 mm. longis 1 mm. latis apiculatis brevissime petiolulatis glabrescentibus, rhachide gracile inferne pubescente superne glabro deinde omnino glabro ; stipulae oblongo-triangulares. *Flores* in axillo quoque 2-3-aggregati ; bractae cymbiformes, 3.5 mm. longae, albo-membranaceae. *Calyx* 4.5 mm. longus, dense albo-pubescent, dentibus triangularibus acute apiculatis 1 mm. longis viridibus. *Corolla* lutea ; vexillum ovato-oblongum, supra medium constrictum, apice

rotundatum, 7 mm. longum, 3 mm. latum ; alae 6.5 mm. longae, 1 mm. latae ; carina 7 mm. longa, 1.5 mm. lata. *Ovarium* cylindricum, sessile, 2 mm. altum, vix 1 mm. diametro, dense tomentosum ; stylus 4.5 mm. longus, glaber.

N. Persia : near Tabriz, 1927, *Gilliat-Smith* 1905a.

**A. constrictus** var. **tomentosus** *Turrill*, var. nov. ; a var. typica foliis foliolisque valde tomentoso-hirsutis, spinis robustioribus rigidioribus, floribus leviter majoribus differt.

N. Persia, near Tabriz, 1927, *Gilliat-Smith* 1905b.

The species, *A. eriostylus* Boiss. et Hausskn. [in Boiss. Flor. Or. ii. 316 (1872)], with which *A. constrictus* is compared is known only from south-west Persia where it was collected, at 8000 feet altitude, "in montibus Kuh Sawers et Kuh Eschker," by Haussknecht. The affinity with our species is close, especially in the reduction of each inflorescence branch to a group of 2 or 3 axillary and sessile flowers.

**Astragalus (§Ornithopodium) variistipula** *Turrill*, sp. nov. ; ab *A. shelkovnikovii* Grossheim e descriptione stipulis lanceolato-linearibus vel lanceolato-triangularibus, calyce leviter brevior, vexillo haud oblongo-lineare 1.3 cm. longo, legumine albo-hirto haud villosa differt.

*Planta* perennis, ad 2.2 dm. alta. *Caules* numerosi, tenues, erecti (?), a basi ramosi, adpresse griseo-canescens. *Folia* 2-5 cm. longa, utrinque adpresse griseo-canescens, foliolis 3-5-jugis anguste vel angustissime linearibus acutis usque ad 2.2 cm. longis vix 1 mm. latis ; stipulae herbaceae, lanceolato-lineares, acutae, 8 mm. longae, 1 mm. latae, vel lanceolato-triangulares multo breviores latioresque. *Racemi* 5-12-flores, subaxi, foliis superantes vel aequantes ; bracteae subulatae, vix 2 mm. longae. *Calyx* tubulosus, adpresse albo- vel albo-nigroque-pubescent, 8 mm. longus, 2 mm. diametro, dentibus subulatis fere aequantibus 2 mm. longis. *Corolla* purpurea ; vexillum 1.3 cm. longum, 6 mm. latum, obovatum sed apicem basinque versus attenuatum ; alae 1.1 cm. longae, 2 mm. latae ; carina 1.05 cm. longa, 2.5 mm. lata. *Ovarium* anguste cylindricum, 5 mm. longum, puberulum, stylo 6 mm. longo. *Legumen* pendulum, arcuatum, compresso-cylindricum, usque ad 3.5 cm. longum, adpresse albo-hirtum haud villosum, dorso sulcatum, inter semina leviter constrictum.

N. Persia : near Tabriz, flowers May 1927, fruits June 1927, *Gilliat-Smith* 1901.

This species is very near to *A. shelkovnikovii* as described by Grossheim in Beih. Bot. Centrbl. xlv. 2. 220 (1927), from near Drzhulfa and near Tabriz, and said also to occur in Russian Armenia. Unfortunately no authenticated specimen of Grossheim's species is available for comparison but, unless his description is misleading or the fluctuations are greater than one would expect in a species of this genus, our species will stand.

**Trachyspermum ammi** (L.) *Sprague*, comb. nov.

N. Persia : Tabriz, weed in a garden, July-Aug. 1927, *Gilliat-Smith* 2104.

This is the *Sison ammi* L. Sp. Pl. 252 (1753). It has been known by many names and a fairly full synonymy is given by Thellung in Hegi, Illustr. Flor. Mit.-Eur. v. 2. 1167 (1925) and l.c. 1140 (foot-note). A paper dealing with the history of this plant has been prepared for publication.

**Pyrethrum Gilliatii** *Turrill*, sp. nov. ; a *P. myriophyllo* C. A. Mey. foliis minoribus, involucris phyllis apice valde scariosis facile distinguitur.

*Herba* basi suffruticosa, adpressissime canescens. *Caules* erecti, simplices, usque ad 2.6 dm. alti sed interdum multo breviores, teretes, longitudinaliter striati, apice compositi corymbosi, polyccephali. *Folia* ambitu anguste oblonga, 1.5–3.5 cm. longa, ad 7 mm. lata, in lacinulas minimas obovatas vel obovato-oblongas vel oblongas apice obtusas vel rotundatas utrinque dense canescente-pubescentes uni- vel bipinnatisecta. *Capitula* late ovata, 7 mm. longa, 5 mm. diametro, involucris phyllis pubescentibus internis apice valde scariosis 5.5 mm. longis plus minusve laceris. *Flores* omnes tubulosi sed externi interdum foeminei, 6 mm. longi. *Achenia* immatura anguste cylindrica, 2.75 mm. longa, longitudinaliter striata, corona minima vix dentata.

N. Persia : hills to the south of Tabriz, 1927, *Gilliat-Smith* 1937. Earlier specimens of dwarfer habit, presumably from the same locality, and received as Nrs. 1688 and 1732, belong to this species.

If, conforming with Bentham and Hooker's *Genera Plantarum* and other works, the genus is sunk in *Chrysanthemum* the species is to be known as *C. Gilliatii* Turrill.

**Cirsium yamense** *Turrill*, sp. nov. ; a *C. arachnoideo* M.B. involucris phyllis subuncinato-recurvis simile capitulis minoribus differt.

*Caulis* 4 dm. longus, teres, superne glaber, inferne minime albo-arachnoideus. *Folia* ad 11.5 cm. longa, saepissime breviora, in lacinias lanceolatas vel triangulari-lanceolatas apice breviter spinosas pinnatifida, caulina amplexicaulia sed haud decurrentia, in pagina superiore strigosa, inferiore glaberrima. *Capitula* (in exemplare) 9–10, axillaria, haud aggregata, ovata, flosculis inclusis 2.5 cm. longa, 1.8 cm. diametro, leviter arachnoidea ; involucris phylla tenuiter lanceolata, apice subuncinato-recurva, omnia pallide viridia, externa 6–7 mm. longa, intimis 1.5 cm. longis. *Corolla* cylindrica, 1.3 cm. longa, 1.25 mm. diametro. *Pappi* setae albae, 1.3 cm. longae. *Achenia* immatura compresso-oblonga, leviter obliqua, 4 mm. alta, 1.7 mm. lata.

N. Persia : Tabriz district, Yam, 7th Aug. 1927, *Gilliat-Smith* 2001 ; 1928, *Gilliat-Smith* 2452.

**Cirsium yamense** var. **arachnoideum** Turrill, var. nov.

*Folia* in pagina inferiore arachnoidea.

N. Persia : Yam, Aug. 1928, Gilliat-Smith 2462.

**Cousinia compacta** Turrill, sp. nov. ; a *C. chrysacantha* Jaub. et Spach foliis radicalibus haud pinnatipartitis, involucris phyllorum mediorum spinis longioribus recedit.

*Herba* biennis compacta, adpresse albido-lanuginosa. *Caules* usque ad 2.6 dm. alti sed saepissime breviores, simplices vel ramosi, teretes. *Folia* radicalia ovata, breviter petiolata, 4.5 cm. longa et 3 cm. lata vel majora, margine spinosa sed haud vel vix lobata ; caulina valde decurrentia et spinosa, plus minusve lobata, longitudine variabilia. *Capitula* subsessilia vel pedunculo usque ad 1 cm. suffulta, late ovata, flosculis inclusis 2 cm. longa, spinis exclusis 1 cm. lata, 40-50-flora, involucris phylla 35-40, externa albo-lanata, basi late ovata, viridia, in spinam ad 1.6 cm. longam duram flavidam patentem abrupte contracta ; media late lanceolata 1 cm. longa, 3.5 mm. lata, viridia, apice breviter spinoso-attenuata ; interna 1.3 cm. longa, lineare-oblancoolata, membranacea ; receptaculi setae laevissimae vel ciliolatae. *Corolla* cylindrica, supra medium 1.5 mm. diametro, medio abrupte angustata, infra medium 0.5 mm. diametro, pallide purpurea. *Achenia* oblique compresso-oblonga, 3 mm. alta, 1.5 mm. lata, leviter rugosa, nigra.

N. Persia : near Tabriz, 25th June 1927, Gilliat-Smith 1956 (nomenclatural type) and 1755 (received 26th July 1926).

**Pterotheca obovata** Boiss. et Noë in Boiss Diagn II. iii. 98 (1856).

N. Persia : near Tabriz, Gilliat-Smith 1678 (6th July 1926), 1697, 2044. *Distrib.* E. Asia Minor, Caucasia, Armenia, Iraq, Persia, Baluchistan, Afghanistan.

The type of this species was collected 'in subalpinis Armeniae meridionalis circâ Ardana cl. Noë.' The description given by Boissier is an excellent one and agrees quite well with our specimens. Schischkin, in Grossheim A. et Schischkin B. *Plantae orientales exsiccatae* 150, accepting the genus *Lagoseris* makes a new combination, *L. marschalliana*, on the basis of *Crepinia marschalliana* Reichb. Fl. Germ. excurs. 269 (1830-32). Reichenbach's supposed species is, however, not described beyond the remark 'plantae tauricae, quae mihi propter achenia triformia.' I therefore consider the name is merely a *nomen nudum* and consequently reject the trivial. Bornmüller in Verh. Zool.-Bot. Ges. lx. 147 (1910) makes the combination *Lagoseris obovata*, but it seems quite clear that the generic name *Pterotheca* must stand.

**Campanula propinqua** Fisch. et Mey. var. **parviflora** Turrill, var. nov. ; floribus minoribus distinguitur.

*Herba* annua, caulibus dichotome ramosis vel ramosissimis patule striguloso-hispidis usque ad 1 dm. altis. *Folia* oblonga vel elliptico-oblonga, apice subacuta, basi leviter angustata, 1-1.5 cm.



longa, 4-5 mm. lata, pagina utraque striguloso-hispida, trinervia, integra, sessilia vel fere sessilia. *Flores* parvi, numerosissimi, in dichotomiis terminalibusque dispositi, breviter pedicellati. *Calyx* strigosus, laciniis lanceolatis floriferis 4 mm. longis erectis, appendicibus triangularibus acutis 1-2 mm. longis. *Corolla* circiter 8 mm. longa, extus hirta.

N. Persia : Yam, Dik Dash, north-west of Tabriz, Aug. 1928, *Gilliat-Smith* 2465.

At first glance the specimen on which this new variety is based looks very different from authenticated material of the species as described by Fischer et Meyer. Comparison of the characters of all the organs (capsules excepted) has, however, failed to reveal any structural differences. The very numerous small flowers give a peculiar facies to the type specimen of the var. *parviflora*, but in another specimen (Yam, 24.6.28, Nr. 2340) received from Gilliat-Smith the flowers are slightly larger and form a partial link to specimens of the species in Herb. Kew.

### ***Convolvulus commutatus* Boiss.**

N. Persia : east of Lake Urmia, May 1926, *Gilliat-Smith* 1594. Hills N. of Tabriz, 15th May 1927, *Gilliat-Smith* 2062 (forma depauperata caulibus brevioribus, inflorescentiis 2-3-floris, calycis brevioribus quam in planta vulgari).

The second specimen quoted above has puzzled me considerably. In some characters it resembles *C. shirazianus* Boiss., which may be no more than a variety or form of *C. commutatus*. Bornmüller [in Beih. Bot. Centrbl. Bd. xxxiii. 2, 169 (1915)] briefly describes a f. *suffrutescens* of *C. commutatus* and has since [in Mitt. Thur. Bot. Ver. xxxvii. 53 (1927)] raised it to the rank of a species under the name *C. chamaerhacos* Bornm. The specimen of Th. Strauss on which the species is based is from near the village of Besri, in the southern part (Kuh-i-Besri) of the Kuh-i-Schahsinde to the west by north of Sultanabad (see map in Peterm. Mitt. 1905, t. 21). The characters given in the description are those of our plant except that the calyx is longer (c. 1.1 cm.) in the latter. Certainly the species, if such it be, seems much nearer to *C. commutatus* than to *C. oxysepalus* with which it is especially compared.

### ***Heliotropium dolosum* De Not. Rep. fl. lig. 319 (1844-48?).**

N. Persia : near Tabriz, Sept. 1925, *Gilliat-Smith* 1308 ; weed in garden, Tabriz, 1927, *Gilliat-Smith* 2126.

### ***Heliotropium ellipticum* Ledeb. in Eichw. Casp.-cauc. 10, t. iv. (1831-33).**

N. Persia : hills south of Tabriz, 11th June 1927, *Gilliat-Smith* 2060 ; near Tabriz, 1927, *Gilliat-Smith* 2127.

The names used above require some explanation. It is doubtful whether one or two species are represented. Seeds have been collected and it is hoped that cultural experiments at Kew will

throw more light on this problem. At present the matter stands as follows.

In Salt's Travels in Abyssinia, Appendix lxiii. (sphalm. lxii.), on the authority of Robert Brown the name *Heliotropium ellipticum* is listed but is only a *nomen nudum*. I have failed to find that it was ever attached to a description and the name is not mentioned in The Flora of Tropical Africa. It follows on the basis of the Vienna Rules that the name can be used for another plant.

In Eichwald's Plantarum novarum vel minus cognitarum quas in itinere Caspio-Caucasico observavit, with the dates 1831-33 on the title page, at page 6, the name *Heliotropium ellipticum* Led. is used and at page 10 (in another pagination) a Latin description is provided and the plant is figured with dissections at tab. iv. The habitat is given as "in orientali littore caspii maris, prope Krasnowodsk." The description and figure, so far as they go, agree with the two sheets (2060, 2127) of Gilliat-Smith's quoted above.

In 1840 Steudel in his Nomencl. i. 744 introduces the name *H. eichwaldii* as a substitute for *H. ellipticum* Ledeb. non R. Brown. As we have seen above this is not now considered necessary. De Notaris, in his Repert. Florae Ligusticae 318 (1844-1848), published with a description his *Heliotropium dolosum* with the type "in litore Liguriae occiduae prope il Ceriale legit hortulanus H. R. Bot. genuensis." Unfortunately I have not seen either a type or a specimen from the classic locality, but judging from the description (which on modern standards is decidedly imperfect) and from the numerous specimens from the Balkan Peninsula referred by various authorities, as I think correctly, to this species, I consider the two Tabriz plants (1308, 2126) quoted above must be named *H. dolosum*. They differ, so far as can be ascertained from other specimens of the species at Kew, only in the somewhat thinner texture and less dense indumentum of the leaves. These may be merely fluctuating characters modified by habitat conditions (as garden weeds?).

Boissier [in the Flora Orientalis iv. 131 (1879)] unites the two species, here kept distinct, under the name *H. eichwaldii* Steud., referring also to DC. Prodr. ix. 535 (1845). Kuznetsoff and Popoff in Flora Cauc. crit. xxxvii. 88 (1913) use the name *H. ellipticum* Ledeb., but how far they include the South European and Oriental material it is difficult to say. The name *H. dolosum* does not appear in their synonymy or in the discussion, yet the geographical distribution given includes the range of what are here considered the two species *H. dolosum* and *H. ellipticum*.

Halácsy, Consp. Fl. Gr. ii. 317 (1902), retains the name *H. dolosum* for the Greek specimens, quoting *H. eichwaldii* as a synonym from Boiss. non Steud. and *H. ellipticum* Nym. Consp. 508, quoad pl. graecam, non Led. Bornmüller, in Bot. Centrbl. Beih. xx. ii. 182 (1906), uses the name *H. dolosum* for a plant from Sultanabad, in incultis, with the remark "H. Eichwaldii Boiss. fl. Or. iv. 131" non (?) Steudel. With Halácsy and Bornmüller I am at present in

agreement, but it is obvious that more extensive field and cultural studies are essential before the questions here raised can be settled. For the time being I separate the two species as follows :

*ellipticum* : leaves broadly elliptic or elliptic-ovate rounded at the base, calyx as long as the tube of the corolla at the flowering stage, style minutely hispidulous.

*dolosum* : leaves long-elliptic with a gradually tapering base, calyx slightly shorter than the tube of the corolla at the flowering stage, style distinctly hispid or hirsute.

**Cynoglossum montanum** L. subsp. **extraeuropaeum** Brand var. **asiaticum** Brand in Cyprus.

The only species of *Cynoglossum* recorded by Holmboe [Studies on the Vegetation of Cyprus, 147 (1914)] from Cyprus is *C. pictum* Ait. (more correctly *C. creticum* Mill.). Three sheets of specimens in Herb. Kew, collected by Sintenis et Rigo, in monte Troodos, 18.6.1880, Nr. 828, are, however, *Cynoglossum montanum* L., although on the label the name given is '*Paracaryum myosotoides* Schrk.' After a prolonged attempt I have been unable to separate specifically *C. montanum* L. sensu Brand from *C. nebrodense* Guss. The supposed differential characters given by Brand do not hold for the Kew material. I can find no constant differences between the height of the fornicies relative to the sinuses of the corolla lobes nor between the lengths of the fruiting pedicels relative to the calyx. On the question of *C. montanum* L. non Lam. the reader is referred to Lacaita in Bull. Ort. Bot. Nap. iii. 290 (1913). It should be noticed that the same number of Sintenis et Rigo (Nr. 828) is quoted by Brand [Pflanzenr. iv. 252, 63 (1921)] as *Mattiastrum lithospermifolium* (Lam.) Brand.

**Mattiastrum Aucheri** (A.DC.) Brand in Samos.

Brand, in Engler's Pflanzenr. iv. 252, 70 (1921), describes a new variety of *Rindera graeca* Boiss. et Heldr. as var. *incana*. The specimens quoted for this variety are Samos : auf dem Berge Ambelos (*Forsyth Major* n. 410 ; Herb. Boiss.) ; Mykale (*Forsyth Major* n. 665). A sheet of the former number is at Kew and is written up as *Mattia graeca* (Boiss. et Heldr.) A.DC. It is certainly not this species, which has smooth plane faces to the nutlets, but has been found to agree with *Mattiastrum Aucheri* (A.DC.) Brand in Fedde Repert. xiv. 150 (1915). A comparison of all parts of the plant with the sheet of Aucher-Eloy 2285 at Kew has failed to reveal any structural differences. The type of *M. Aucheri* came from "Caria, circa hodiernam urbem Moglah," and the geographical extension to Samos is, therefore, not great.

**Bilegnum medium** Turrill, sp. nov. ; a *B. bungei* (Boiss.) Brand corymbo multifloro, corollis majoribus, fornicibus longioribus tubi parti mediae affixis recedit.

*Herba* erecta, incano-lanata, caulibus usque ad 2·7 cm. longis simplicibus teretibus. *Folia caulina* inferiore anguste linearia,

3 cm. longa, 1-1.5 mm. lata, media linearia, acuta, sessilia, basi vix attenuata, 4-5 cm. longa, 2.5 mm. lata, uninervia, integra, pagina utraque pilis longis simplicibus adpressis vel leviter subpatentibus densissime instructa, superiora breviora lanceolato-linearia. *Circinni* in corymbum terminalem laxum multiflorum (30-60-florum) dispositi, pedicellis floriferis circiter 5 mm. longis, fructiferis 1.2 cm. longis. *Calyx* plus minusve usque ad basin partitus, lobis lineari-vel lanceolato-oblongis subobtusis 6 mm. longis 1-2 mm. latis externe albo-villosis. *Corolla* cylindrica, 7-8 mm. longa, lobis late ovato-oblongis 1-1.5 mm. longis, fornicibus triangularibus 1.25 mm. longis tubi parti mediae affixis. *Filamenta* corollam duplo superantia. *Stylus* 9 mm. longus, glaber. *Nuculae* cum stylo cohaerentes, laeves, scaphiformes, margine duplici praeditae; margo interior grosse dentatus, exterior irregulariter dentatus vel subinteger.

N. Persia: Urmia district, May 1926, *Gilliat-Smith* 1542.

This very interesting plant is the second species of the genus to be described. *Mattia bungei*, described by Boissier in the *Flora Orientalis* iv. 274 (1875) has been a taxonomically much-disputed species considering that only type gatherings are known. Gürke in Engler und Prantl, *Pflanzenfam.* iv. 3. a. 106 (1893) relegated it to the genus *Rindera*. Kuznetsoff, in *Trav. Mus. Bot. Acad. Imp. Sci. St. Petersb.* vii. 35 (1910), follows Gürke by placing the species in *Rindera*, Sect. *Mattia*. Lastly A. Brand, in *Fedde Repert.* xiii. 549 (1915) and in Engler's *Pflanzenr.* iv. 252, 54 (1921), created a new genus, *Bilegnum*, for this one species. The type of *Bilegnum* was collected, according to Boissier "in montibus Persiae bor-orientalis prope Schahrud" and Kuznetsoff repeats this locality. Brand quotes "bei Deh-Malloh 27.5.1858 (Bunge)" and this agrees with the only specimen at Kew. I have not traced a Deh-Malloh in the Schahrud district.

The double margin to the nutlets is the characteristic feature of the genus *Bilegnum* and is equally well seen in *B. bungei* and in the new species here described. Accepting on this basis the genus as distinct from *Rindera* and *Mattia* (whether regarded as two genera or as one genus) the new species necessitates some revision of Brand's generic description. It is now obvious that Brand has included what are merely specific characters in this. The emended generic description must now run as follows:—

*Calyx* fere ad basin partitus. *Corolla* cylindrica, lobis brevibus. *Fornices* inferiori vel mediae parti tubi affixi. *Filamenta* corollam duplo superantia. *Nuculae* cum stylo cohaerentes, laeves, scaphiformes, margine duplici praeditae; margo interior grosse dentatus; margo exterior integer vel irregulariter dentatus; margo interior supra discum, exterior supra interiorem introflexus.

Herbae foliis lineari-lanceolatis vel linearibus, circinnis corymbosis.

**Onosma petiolatum** *Turrill*, sp. nov. ; ab *O. pachypodo* Boiss. foliis superioribus basi gradatim angustatis inferioribus distincte petiolatis calycis segmentis angustioribus acuminatis distinguitur.

*Herba* perennis ; radix lignosa. *Caules* erecti, teretibus, basi suffrutescentes, pilis simplicibus brevibus adpressis e tuberculo parvo ortis instructi, usque ad 2.6 dm. alti, basi circiter 4 mm. diametro. *Folia* caulina anguste elliptica vel oblanceolato-elliptica, apice attenuato-acuta, basi gradatim angustata, inferiora distincte angustato-petiolata, usque ad 7 cm. longa, 2.2 cm. lata, pagina utraque pilis adpressissimis e tuberculo parvo glabro ortis pubesque minima adpressa dense praedita ; folia radicalia multo minora, plus minusve apice obtusa. *Inflorescentia* 6–8-flora ; bractae inferiores lanceolatae, gradatim acuminatae, superiores setaceae ; pedicelli, incrassati, 1–2 mm. longi. *Calyx* in lacinias lineares acuminatis interdum leviter inaequales 1.6 cm. longas dense adpresso-sericeas quinquepartitus. *Corolla* clavato-cylindrica, 2.7 cm. longa, 5 mm. diametro, extus velutina, lobis late ovatis 2 mm. longis. *Antherae* 9 mm. longae, inclusae ; filamenta circiter 2 mm. longa. *Stylus* 3 cm. longus. *Nuculae* ovoideae, 6 mm. longae, acutae, laeves, nitentes.

N. Persia : Yam, 19th July 1928, *Gilliat-Smith* 2435.

This plant is undoubtedly very closely related to *O. pachypodum* Boiss. and may, with the advent of more collections, prove to be no more than a variety of it. The distinctly petioled lower leaves give the specimens an appearance different from that of the two sheets of *O. pachypodum* at Kew. Boissier, in *Flor. Orient.* iv. 187 (1879), describes the nutlets of *O. pachypodum* as "obsolete scrobiculatis." It is somewhat difficult to interpret this phrase, but the nutlets of our plant are smooth and shining with a few very indistinct marks in the lower part. It may be noted that Grossheim [Beih. Bot. Centrbl. xlv. 232 (1827)] records *O. pachypodum* Boiss. from "in jugo Meshau-dagh prope st. viae ferr. Jam, 2100–2200 m., in calcareis Fl. Fr. 20. vi," and his plant may be the same as ours. *O. pachypodum* was originally described from Murch Mahal, Elbrus (*Kotschy* 158).

**Bellevalia tabriziana** *Turrill*, sp. nov. ; a *B. decolorante* Bornm. foliis multo angustioribus, a *B. micrantha* Boiss. floribus breviter pedicellatis haud sessilibus praecipue distinguitur.

*Bulbus* elongato-ovatus, 3 cm. longus, 1.3 cm. diametro. *Folia* 3–4 anguste linearia, usque ad 1.5 dm. longa, 2–2.5 mm. lata, obtusiuscula, glaberrima, haud ciliata, in parte superiore recurvata, scapo multo longiora. *Scapus* solitarius, ad 1 dm. longus ; racemus ovato-cylindricus, 5–12-florus, sub anthesi 1.5–2 cm. longus et 0.75–1 cm. latus, glaber, rhachide amoene purpureo-tincta, bracteis 1–1.5 mm. longis crassis, pedicellis 1–1.5 mm. longis, floribus suberecto-patentibus. *Perigonium* tubuloso-campanulatum, 6 mm. longum, roseo- vel caeruleo-purpureum segmentis ovatis vix 2 mm. longis et 2.5 mm. latis vix patentibus nervo uno conspicuo instructis. *Filamenta* medio tubo adnata, inferne connata, parte superiore

libera triangulari 1.25 mm. longa ; antherae atrovioleae, cordato-ovatae, 1.5 mm. longae. *Ovarium* elongato-ovoideum, 3 mm. altum, vix 2 mm. diametro, minutissime papillosum, stylo 1.5 mm. longo.

N. Persia : hills north of Tabriz, 10th April 1927, *Gilliat-Smith* 1775 (nomenclatural type) ; hills north and south of Tabriz, 16th April 1928, *Gilliat-Smith* 2211.

*Bellevalia* is considered by many authors at most as only a section of *Hyacinthus*. By those who wish to sink our species in the latter genus the name *H. tabrizianus* Turrill can be used. If *Bellevalia* be retained in the sense of Boissier, *Flora Orientalis* v. 300 (1884), the species here described is to be placed in the section *Hyacinthella* near to *B. micrantha* Boiss. *Diagn. Ser. i. v. 63* (1844) which is known from Bithynia and Northern Anatolia, and, as the var. *puberula* Hausskn. et Bornm., from Amasia. *B. tabriziana* is also morphologically similar (*e descriptione*) to *B. decolorans* Bornm. *Beih. Bot. Centrbl.* xxiv. 2. 109 (1908) from Mt. Kuh-Sefid, Kermanschah district, Luristan. This, however, is said to have linear-lanceolate leaves 6 mm. broad.

### XXXIX.—THE BOTANICAL NAME OF SHRUB YELLOW-ROOT. T. A. SPRAGUE.

The aberrant North American ranunculaceous plant known by the vernacular name "Shrub Yellow-root" appears in North American floras and other botanical works—e.g. Gray's *New Man. Bot.* ed. 7 (1908), Britton and Brown, *Ill. Fl.* ed. 2 (1913), Bailey, *Man. Cult. Pl.* (1924), and Rehder, *Man. Cult. Trees and Shrubs* (1927)—under the name *Zanthorhiza apiifolia* L'Hérit. "(1784)". Nevertheless its correct scientific name under International Rules and American Code is *Xanthorhiza simplicissima* Marsh. (1785).

The mistake arose as follows : L'Héritier's *Stirpes Novae*, in which the name *Zanthorhiza apiifolia* appeared, bears the date 1784 on the title-page. That date was apparently accepted without further investigation by Pfeiffer, *Nomenclator Botanicus* (1874), Dalla Torre et Harms, *Gen. Siphonog.* (1901), and others. Examination of L'Héritier's *Stirpes Novae*, however, shows that it contains 7 Fasciculi, the title page of the fourth Fasciculus, in which *Zanthorhiza apiifolia* L'Hérit. appeared, bearing the date 1785. But even that is incorrect. As pointed out by Britten and Woodward (*Journ. Bot.* 1905, 267), "one of the chief peculiarities of L'Héritier's publications is that, although they were prepared at the time indicated, none of them appeared at the date printed on the title-page." According to the very careful investigations of those writers, Fasciculus 4, containing pp. xi, xii, 63-102, tt. xxxi-xlviii, was issued in March, 1788. Hence the generic name *Zanthorhiza* L'Hérit. is antedated by *Xanthorhiza* Marsh., and the binominal *Z. apiifolia* L'Hérit. by *X. simplicissima* Marsh.

**Xanthorhiza** Marsh. Arbust. 167 (1785); Schreb. Gen. 727 (1791), as "*Xanthorrhiza*"; Torr. Fl. U.S. i. 333 (1824); Torr. and Gray, Fl. N. Am. i. 40 (1838), as "*Xanthorhiza*"; Endl. Gen. 850, n. 4803 (1839); Benth. et Hook. f. Gen. Pl. i. 9 (1862); Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 2, 58 (1888), as "*Xanthorrhiza*"; Post et Kuntze, Lexic. Gen. Phan. 596 (1903).

*Zanthorhiza* L'Hérit. Stirp. Nov. fasc. 4, 79, t. xxxviii (1788); Juss. Gen. 234 (1789); Willd. Sp. Pl. i. 1568 (1798); DC. Syst. i. 386 (1818); Robins. and Fernald in Gray's New Man. Bot. ed. 7, 408 (1908); Britton and Brown, Ill. Fl. ed. 2, ii. 89 (1913), as "*Xanthorrhiza*"; Bailey, Man. Cult. Pl. 280 (1924); Rehder, Man. Cult. Trees and Shrubs, 215 (1927).

**Xanthorhiza simplicissima** Marsh. l.c. (1785).

*Zanthorhiza apiifolia* L'Hérit. l.c. (1788); Torr. l.c. (as "*Xanthorhiza apiifolia*"); Torr. and Gray, l.c.; Robins. and Fernald, l.c.; Britton and Brown, l.c. (as "*Xanthorrhiza apiifolia*"); Bailey, l.c.; Rehder, l.c.

The early authors who adopted the generic name *Xanthorhiza* Marsh. in preference to *Zanthorhiza* L'Hérit. seem to have done so purely on philological grounds, and not for reasons of priority. They rejected the specific epithet *simplicissima*, proposed by Marshall, in favour of *apiifolia* L'Hérit., probably because the latter epithet seemed more suitable. Marshall of course called the plant *simplicissima* because the stems are "generally simple, or without branches."

It may not be amiss to draw attention to the series of Bibliographical Notes published in the "Journal of Botany." An index of those which appeared during the years 1893-1924 was given in Journ. Bot. 1926, 274. Many of them contain valuable information as to dates of publication inaccessible elsewhere. They do not seem to have been fully utilized, judging from the cases of *Xanthorhiza* and *Engelmannia* (vide *Kew. Bull.* 1929, 82).

## XL.—MISCELLANEOUS NOTES.

GIACOMO BRESADOLA.—It is with regret that we learn of the death, on June 9th last, of the Abbé G. Bresadola of Trento, in his 82nd year.

Bresadola was perhaps the most outstanding figure among modern mycologists, remarkable both for the thoroughness of his knowledge of fungi, especially Basidiomycetes, and also for the universal esteem and affection in which he was held. It would be difficult to estimate how many of the succeeding generations of systematic mycologists have owed their first guidance in difficult groups of Hymenomycetes to his unfailing helpfulness and courtesy. Perhaps that which endeared him most to his correspondents was his modesty, shown in the simple statement, when he was unable to find a name for a species, "à moi inconnue."

His early studies were on the fungi to be found round Trento, and he tells us in the preface to his first work that he received much friendly assistance from Dr. Quélet. This first work (*Fungi Tridentini novi, vel nondum delineati*), published in 1881 and consisting of two volumes, at once stamped its author as a mycologist of the first rank. It contains 217 coloured plates of great merit, prepared by Bresadola himself, and accompanied by very careful and accurate descriptions and critical notes.

His subsequent work is marked by the same thoroughness. He attempted no new classification, but his knowledge of species and genera of the higher fungi was unrivalled, and his opinion recognised everywhere as authoritative. In common with Patouillard, Bresadola developed especially the use of microscopic characters for purposes of identification, and to him we owe the foundations of present-day knowledge of such difficult groups as Thelephoraceae and Hydnaceae.

In addition to his knowledge of European fungi, he became also, especially in his later years, an authority on the Hymenomycetes, notably the Polyporaceae, of tropical regions. This knowledge was gained by a painstaking study of the type specimens of older authors, of which all the chief herbaria of Europe show evidence in his notes attached to the sheets. He was for some years an active correspondent of Kew, and in return for facilities for study enriched the Herbarium with many valuable specimens of his own determination.

In three of his latest papers he published in connected form lists of synonyms which he had compiled from this study of the types preserved in various collections.

Two years ago, on the occasion of his 80th birthday, as a testimonial from mycologists all over the world, the Società Botanica Italiana, in conjunction with the Museum of Natural History of Trento, invited subscriptions towards publishing Bresadola's collection of water-colour drawings of fungi. Already nine volumes of the "*Iconographia Mycologica*" have appeared, and it is very satisfactory to learn that the materials for its completion are in the hands of Professor Traverso, and that the work will suffer no delay or curtailment on account of the passing of its eminent author. When completed it is estimated to consist of twenty volumes, each with fifty coloured plates and accompanying text, a fitting memorial to a great mycologist.

E. M. W.

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**Botanical Expeditions: British Guiana.**—With the aid of funds placed at the disposal of the Ministry of Agriculture and Fisheries for the purpose of affording assistance to the Colonies in the investigation of their local floras, it has been possible for Mr. N. Y. Sandwith, a member of the Herbarium staff at Kew, to be attached to the Oxford University Expedition to British Guiana. Mr. Sandwith has been working for some time on the British Guiana collections in the Kew Herbarium, with a view to the preparation of



a Flora of the Colony. The opportunity to study the vegetation on the spot and to make extensive collections in the little-known hinterland will greatly facilitate the preparation of the Flora when the work is undertaken.

The Expedition is under the leadership of Major R. W. G. Hingston, M.C., who was medical officer and naturalist to the third Mount Everest Expedition, and who was second in command of the Oxford University Expedition to Greenland last year. It will have its base in a locality north of the Essequibo, and will operate mainly in the rain-forest region. Part of the Expedition will return in two months, but arrangements have been made for Mr. Sandwith to remain in British Guiana for the full period of four months.

**Somaliland.**—An opportunity for the study in the field of tropical vegetation of an entirely dissimilar type has been afforded by the British-Italian Somaliland Boundary Commission. The following invitation to attach a Botanist to the Commission has been received from the Secretary of State for the Colonies :—

Colonial Office,  
Downing Street.

38III/29.

4th June, 1929.

Sir,

I am directed by Mr. Secretary Amery to inform you that arrangements are being made for the demarcation of the boundary between British Somaliland and Italian Somaliland, as defined by the Anglo-Italian Protocol of the 5th May, 1894. It is proposed that the Joint British and Italian Boundary Commission should begin work on the boundary (at Bandar Zaida on the coast) on the 1st September next. The scope of the Commission's work is indicated in the enclosed instructions to be issued to it [not printed], in which the Italian Government have concurred. The British section of the Commission is now being selected and will consist of three military officers, three or four non-commissioned officers, a Royal Army Medical Corps officer, a civil Political Officer and probably a geologist.

2. Mr. Amery has directed that the above information should be conveyed to you, as it has been suggested to him that you might wish to consider the possibility of sending a qualified botanist, or other specialist from Kew to accompany the Commission. Mr. Amery fears that it would not be possible to include any of the expenses involved by the visit of such an expert among those chargeable to the Commission's account ; but he would gladly make arrangements, should you desire it, for any one whom you may care to nominate to be attached to the Commission, and to be given every facility to carry out his work in the areas to be surveyed.

3. Should you desire any further information as to the Commission's work or as to the terrain in which this is to be carried out, Mr. Amery will make arrangements for you to be put into touch with the officer of the Royal Engineers who is to act as Senior British

Commissioner, and also with a Somaliland officer who has been stationed near the boundary concerned.

I am, Sir,

Your most obedient Servant,

(Signed) J. FREDERICK N. GREEN.

The Director,

Royal Botanic Gardens,

Kew, Surrey.

As the country to be traversed is botanically *terra incognita*, the invitation was gladly accepted, with the concurrence of the Ministry of Agriculture and Fisheries and the Empire Marketing Board. Kew has been fortunate in securing the services of Mr. C. L. Collenette, a naturalist with much experience of collecting in Africa and elsewhere. Every facility is being afforded Mr. Collenette by the Colonial Office and the Foreign Office. The Commission is expected to be in the field for about six months.

**A Gift of Cacti.**—At the Royal Horticultural Society's Show at Chelsea in May, 1929, an outstanding display was the exhibit of Cacti and other succulent plants, shown by Mrs. A. Sherman Hoyt, of Pasadena, California. The valuable collection, comprising about 150 plants, together with a large quantity of the natural stone and sand, was transported from California to London with such success that not a single plant suffered injury.

At the close of the Show Mrs. Hoyt most generously presented the collection to Kew, and the plants are now installed in the Succulent House. A portion of the bed at the north end of the house has been cleared for their reception; and the native stone and sand have been utilised in giving the plants as natural a setting as possible. This arrangement preserves its general interest, and, at the same time, demonstrates its educational value.

Among so many magnificent plants several are new additions to the Kew collection. The following are particularly noticeable on account of their size and grotesque appearance. *Ferocactus Lecontei* Britton & Rose is represented by three large specimens, each with a stem over 3 feet high and 18 inches in diameter, covered with a thick network of stout spines of a reddish colour. In smaller plants the spines are a brilliant red. *Echinocactus polycephalus* Engelm. & Bigelow, of which there are several fine specimens, is remarkable in having from 6 to 15 stems which spring from the same base. The stems are from 15 to 18 inches high and 10 or 12 inches in diameter, and are covered with exceptionally stiff spines.

*Echinocereus Engelmannii* Rümpler is a very distinct species with great numbers of long, straight, crowded spines which completely hide the stem and look like a stiff bottle-brush. Amongst the several plants of this species there are three distinct varieties, differing chiefly in the colour of their spines. The largest specimen consists of 30 stems and is over a yard wide.

A very handsome plant is an unnamed *Opuntia* which may be *O. strigil* Engelm., a rare plant in cultivation. It is 4 feet high and well branched, the joints being covered with numerous long yellow spines. Another well marked and pretty species is *Opuntia Davisii* Engelm. & Bigelow, with slender joints and long yellow spines. A very singular plant, which does not belong to the Cactus family, is *Fouquieria splendens* Engel. This shrub produces long, slender, prickly branches from the base which reach a height of 8 feet. The bright red flowers are borne at the tips of the branches. It is reputed to make an effective and almost impenetrable hedge.

Other genera are represented by several species of *Cereus*, *Mammillaria*, *Agave* and *Yucca*.

This gift is greatly appreciated, and visitors to Kew have expressed the greatest interest in Mrs. Hoyt's unique collection of desert plants which she has so generously presented.

**Sterculia from Fiji.**—In a collection of plants sent from Fiji by Mr. William Greenwood a species of *Sterculia* is present which, though well-known as a Fijian plant, requires a new name.

A. Gray in U.S. Explor. Exped. p. 185, t. 13. (1854), originally described the plant as *Firmiana diversifolia* collected in Fiji. In 1865 Seemann, in Flora Vitiensis p. 23, transferred it to the genus *Sterculia*, making the combination *Sterculia diversifolia* (Gray) Seem., apparently oblivious of the fact that in 1830 G. Don had already given this name to a distinct species found in Australia. As the name is preoccupied Mr. Greenwood proposes to call it ***Sterculia Guppyi* Greenwood.**

**Flora of the Upper Gangetic Plain.**—After a lapse of nine years since the publication of the last part, part 3 of vol. iii of the above named Flora, left incomplete at the death of Mr. J. F. Duthie in 1922, has been published. The present part includes the nine families *Palmae*, *Pandaneae*, *Typhaceae*, *Aroideae*, *Lemnaceae*, *Alismaceae*, *Naidaceae*, *Eriocaulaceae* and *Cyperaceae*. The first six had been completed by Mr. Duthie, and the rest, with the exception of about one-third of the *Cyperaceae* prepared by Dr. W. B. Turrill of Kew, have been dealt with by Mr. R. N. Parker, of the Indian Forest Service and Forest Botanist to the Government of India. It is uniform with the previous parts in every particular.

The completion of the Flora will be welcome and it is a matter for congratulation that a competent botanist has been found to carry out this much needed task. It is to be hoped that the concluding part will find room for a good general index, a survey of the flora of the region concerned as a whole, and for a supplementary list, with keys, to comprise the species discovered since the publication of the earlier parts.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1929 ROYAL BOTANIC GARDENS, KEW

## XLI.—THE CORRECT SPELLING OF CERTAIN GENERIC NAMES: V.\* T. A. SPRAGUE.

The correct spelling of a few additional generic names has been determined by the writer in response to enquiries from various sources.

**Aethionema** *R. Br.* in *Ait. Hort. Kew.* ed. 2, iv. 80 (1812). *Oethionema* Knowles et Westcott, *Floral Cabinet*, i. 41 (1837). *Ethionema* Brongn. *Enum. Gen.* 92 (1843); † ed. 2, 149 (1850). *Aëthionema* Rouy et Fouc. *Fl. France*, ii. 96 (1895); Bub. *Fl. Pyren.* iii. 244 (1901). *Aëthionema* Thell. in Hegi, *Ill. Fl. Mittel-Eur.* iv. 1 Hälfte, 110 (1913).—The original spelling published by Robert Brown stands, although *Aëthionema* or *Aëthionema* are philologically preferable.

**Amelanchier** *Medik.* *Phil. Bot.* i. 135 (1789). *Amelancher* Bub. *Fl. Pyren.* ii. 580 (1900). *Amelancus* Franz Mull. ex Vollm. *Fl. Bayern*, 453 (1914).

**Antholyza** *L. Sp. Pl.* ed. 1, 37 (1753); *Gen. Pl.* ed. 5, 24 (1754). *Antholiza* Neck. *Elem.* iii. 172 (1790). *Antholysa* Jaume St. Hil. *Expos.* i. 148 (1805). *Antholyssa* Aschers. et Graebn. *Syn. Mittelcur. Fl.* iii. 574 (1907).—Linné seems deliberately to have changed the philologically preferable spelling *Antholyssa*, formerly employed by him, to *Antholyza*. This and the two preceding cases were brought to the writer's notice by Dr. A. Becherer.

**Chamorchis** *L. C. Rich.* in *Mém. Mus. Hist. Nat. Paris*, iv. 42, 49, 57 (1818). *Chamaeorchis* Koch, *Syn. Fl. Germ. Helv.* 692 (1837).—It is regrettable that Richard should have altered the name *Chamaeorchis* (*Camaeorchis*) C. Bauh. (*Prodr.* 29: 1620; *Pinax*, 81, no. x.: 1623) to *Chamorchis*, which is philologically less correct. As he deliberately chose the latter spelling, however, it must be retained under the Rules.

**Daboecia** *D. Don* in *Edin. New Phil. Journ.* xvii. 160 (1834). *Dabecia* Spach, *Hist. Veg.* ix. 472 (1840). *Dabeocia* K. Koch, *Dendrol.* ii. Abth. 1, 132 (1872). *Daboëcia* Dalla Torre et Harms, *Gen. Siphonog.* 381 (1903).—Linné latinized St. Dabeoc's name as "Daboecius" in *Erica Daboecii* *L. Sp. ed.* 2, 509 (1762), and in

\*See *K.B.* 1928, pp. 113, 285, 337; 1929, p. 38.

†Not seen by the writer.

*Andromeda Daboecia* L. Syst. Nat. ed. 12, 300 (1767). D. Don chose Linné's specific epithet *Daboecia* as a generic name, and his deliberately chosen spelling cannot be altered, under the International Rules. There is no justification for the diaeresis: both Linné and D. Don employed a diphthong.

**Gerberia** Cass. in Bull. Sc. Soc. Philom. Paris, 34 (1817), nomen; et in Dict. Sc. Nat. xviii. 460 (1820), descr. *Gerbera* Spreng. Syst. iii. 575 (1826).—The generic name is conserved as "*Gerbera* Cass. in Bull. Sc. Philom. (1817) 34," but this citation is inaccurate: Cassini called it "*Gerberia*." It should be made clear in the list of conserved names whether the spelling *Gerbera* is conserved, or the name *Gerberia* Cass. The writer is indebted to Prof. C. E. Moss for this example.

**Huernia** R. Br. in Mem. Wern. Soc. i. 22 (1809). *Heurnia* Spreng. Anleit. ed. 2, ii. Abth. 1. 488 (1817).—Robert Brown "named the genus in memory of Justus Heurnius, one of the earliest collectors of Cape plants and from whose drawings the first account of *Stapelia* was taken." He deliberately adopted the spelling *Huernia* for the genus, doubtless because it was more euphonious than *Heurnia*: the name occurs as *Huernia* on the table facing p. 19, and in a remark on p. 23 under *Piaranthus* as well as on p. 22. Under Art. 24, Brown was at liberty to form the new generic name as he pleased, and under Art. 57 the original spelling *Huernia* must be retained. In the light of Brown's action in regard to *Huernia*, it now seems probable that the spellings *Malcomia* and *Mathiola* (vide Kew Bull. 1928, 356, 357) were deliberately chosen by him.

**Kutchubaea** Fisch. ex DC. in DC. Prodr. iv. 373 (1830); G. Don, Gen. Syst. iii. 492 (1834); Meisn. Gen. 161, Comm. 115 (1838); Endl. Gen. 563 (1838); Spach, Hist. Veg. viii. 372 (1839); Endl. Enchirid. 275 (1841); Reichb. Nomencl. 78 (1841). *Kotchubaea* Regel ex Benth. et Hook. f. Gen. Pl. ii. 98 (1873); K. Schum. in Mart. Fl. Bras. vi. pars 6, 396 (1889); et in Engl. et Prantl, Pflanzenfam. iv. Abt. 4, 84 (1891). *Kotchubea* Baill. Hist. Pl. vii. 436 (1880). *Kotschubeya* Post et Kuntze, Lexic. Gen. Phan. 310 (1903).

Fischer, who proposed the name *Kutchubaea* in a letter to De Candolle, took no steps during the 24 remaining years of his life to correct the spelling, so that he may fairly be assumed to be responsible for it. The name *Kutchubaea* remained unaltered from 1830 till 1873, when Bentham and Hooker changed it to *Kotchubaea* on hearing from Regel that the person to whom the genus was dedicated was Prince Kotchube (not Koutchoube as given by De Candolle). Fischer, however, presumably knew the correct spelling of the name, and he chose to latinize it as "*Kutchubaeus*." Consequently no alteration is admissible in the original spelling *Kutchubaea*.

**Pithecellobium** Mart. in Schrank et Mart. Reg. Monac. 188 (1829) ; sine descr. *Pithecollobium* Mart. in Flora, xx. Band ii. Beibl. 114 (1837). *Pithecolobium* Benth. in Hook. Lond. Journ. Bot. iii. 195 (1844). There is no doubt that Martius originally formed the generic name *Pithecellobium* from *πίθηκος*, monkey and *ἐλάβιον*, ear-ring. Why he subsequently changed it to *Pithecollobium*, while retaining the same derivation, is not apparent, and as the latter spelling may have been due to a lapsus calami or a typographical error, the first spelling used by Martius should be retained. There is no justification for *Pithecolobium*, derived from *λάβιον*, a diminutive of *λόβος*, the lobe of the ear. The name is conserved as "*Pithecolobium* Mart." which is inaccurate. In this, as in similar cases, the spelling employed in Dalla Torre et Harms, Gen. Siphonog. was copied.

**Sacoglottis** Mart. Nov. Gen. et Sp. ii. 146 (1827). *Saccoglottis* Endl. Gen. 1040 (1840).—The generic name seems to have been derived from *σάκος* (more usually spelt *σάκκος*), a sack, and *γλωττίς* a little tongue, in allusion to the tongue-like connective separating the two thecae of the anther. There was therefore no unintentional orthographic error in the name *Sacoglottis*, and it must stand as published by Martius.

**Simarouba** Aubl. Hist. Pl. Guiane Franç. ii. 859, tt. 331, 332 (1772). *Simaruba* DC. in Ann. Mus. Par. xvii. 423 (1811).—Aublet adopted the Carib name "*Simarouba*" for the genus, and that spelling must be retained under Art. 50.

**Stenorynchus** L. C. Rich. in Mém. Mus. Par. iv. 59 (1818). *Stenorhynchos* Spreng. Syst. iii. 709 (1826). *Stenorrhynchus* Reichb. Consp. 67 (1828). *Stenorrhynchium* Reichb. Nom. 55 (1841). *Stenorhyncus* Lindl. in Benth. Pl. Hartweg. 92 (1842). *Stenorhynchus* Lindl. in Ann. & Mag. Nat. Hist., ser. 1, xv. 386 (1845).

## XLII.—THE IRIDACEAE OF BURMANN'S FLORAE CAPENSIS PRODROMUS : II. N. E. BROWN.

In the account of The Iridaceae of Burmann's *Florae Capensis Prodromus* (*Kew Bulletin* 1929, pp. 129-139), I had intended to add a note under *Gladiolus angustus* Burm. (p. 131) concerning *G. Watsonius* Thunb. to the following effect.

In the *Flora Capensis* vi, 169, Baker has confused two plants under the name of *Antholyza revoluta* Burm., under which *G. Watsonius* Thunb. is placed as a synonym. One of these was separated in 1903 by Dr. H. Bolus in Trans. S. Afr. Phil. Soc. xiv, 336, under the name of *Gladiolus Watsonius* Thunb. and a description of it there published. This plant in 1920 was transferred to the genus *Antholyza* as *A. Watsonius* L. Bolus in Ann. Bolus Herb. iii, 11, and in the Kew Herbarium there are several specimens of it named by Mrs. Bolus herself, so that there can be no doubt about

the plant intended by that name. But it is not the same as *G. Watsonius* Thunb. and cannot retain that name. I therefore propose for it the name *Antholyza Priori* N.E. Br., after Alexander Prior, who appears to have been one of the earliest to collect this species. The synonymy will be :—

***Antholyza Priori* N.E. Br.**—*A. Watsonius* L. Bol. in Ann. Bol. Herb. iii, 11. *A. revoluta* Baker in Fl. Cap. vi, 169, partly, not of Burmann. *Gladiolus Watsonius* Bolus in Trans. S. Afr. Phil. Soc. xiv. 336, and Fl. Pl. S. Afr. vi. t. 240, not of Thunberg. Near Cape Town, *Prior* ! (type). Steenberg Rocks, *Wolley Dod* 1135 ! Lion Mountain, *Mac Owan*, *Herb. Norm.* 289 !

The other species is the true *Gladiolus Watsonius* Thunb. and is the plant still called *Antholyza revoluta* by South African botanists. But from Burmann's description of that species—"Staminibus adscendentibus, corollis revolutis, foliis lanceolatis nervosis" it cannot be that species, for the leaves are neither lanceolate nor full of nerves, nor is the corolla revolute. But as the true *A. revoluta* Burm. (loc. cit. p. 131) is at present unknown, I propose that the following be taken as the name and synonymy of *Gladiolus Watsonius* Thunb., of which the specific name is evidently an error for *G. Watsonianus*.

***Antholyza Watsoniana* Pax** in Engl. & Prantl, *Pflanzenfam.* ii. 5, p. 156. *A. revoluta* Baker in Fl. Cap. vi, 169, partly, not of Burmann. *Gladiolus angustus* Burm. Fl. Cap. Prodr. 2, not of Linné. *G. Watsonius* Thunb. Diss. Glad. 14, & Fl. Cap. ed Schultes, 41, excluding other references.

Near Cape Town on Lion Mountain, etc. *Thunberg* ! *Ecklon* 11 ! *Bolus* 3729 ! Piquetberg Road, *Schlechter* 4841 !

### XLIII.—A NEW GENUS OF GRASSES. O. STAPF & C. E. HUBBARD.

***Holcolemma* Stapf et Hubbard**, gen. nov. ; affinis *Setariae* P. Beauv., sed spiculis basi obliquis leviter saccatis, glumis laxis hyalinis vel tenuiter membranaceis nervis 3-5 tenuissimis percursis, lemmate anthoecii inferi leviter saccato in dorso anguste sulcato, sulco tenuissimo facile scisso, ad sulci latera utrinque nervis 2-6, palea anthoecii inferi inter carinas hyalina atque alte depressa extra carinas demum indurata, carinis et marginibus maturitate anthoecium superum amplectentibus, anthoecii superi lemmate paleaque tenuiter crustaceis differt.

*Spiculae* a dorso visae lanceolato- vel ovato-oblongae vel oblongae, acutae vel obtusae, a latere oblique lanceolatae vel oblongae, leviter saccatae, in dorso planae et medio anguste profunde sulcatae, cum pedicello articulatae, fasciculatae vel nonnunquam solitariae, in rhachi paniculae contractae spiciformis ortae. *Anthoecia* bina ; inferum sterile vel ♂ ; superum ♀. *Glumae* solutae, hyalinae vel tenuissime membranaceae ; inferior late ovata vel rotundata, obtusa,



*Holcolemma transiens* Stapf et Hubbard. 1, Plant (natural size). 2, Cluster of spikelets ( $\times 3$ ). 3 and 4, Spikelets, front and back view respectively ( $\times 6$ ). 5, Lower glume ( $\times 6$ ). 6, Upper glume ( $\times 6$ ). 7, Spikelet with glumes removed ( $\times 6$ ). 8, Lemma of lower floret ( $\times 6$ ). 9, Palea ( $\times 6$ ). 10, Lemma of upper floret partially opened out ( $\times 6$ ).



tenuissime 3-nervia, quartam vel tertiam partem spiculae aequans ; superior late ovato- vel elliptico-oblonga, obtusa, nervis tenuissimis 3-5 percursa, tertiam vel dimidiam partem spiculae aequans. *Anthoecium inferum* spiculam aequans ; lemma ambitu lanceolato- vel ovato- oblongum vel oblongum, basi leviter saccatum, in dorso sulco mediano angusto tenuissimo facile scisso percursum, caeterum firme membranaceum, 5-13-nervium ; palea lemma aequans, lanceolato- vel ovato-oblonga, bicarinata, inter carinas admodum concava et hyalina, carinis marginibusque demum induratis. *Anthoecium superum* inferum aequans vel plerumque paulo brevius, dorso lanceolatum vel ovatum, acutum vel acuminatum, a latere oblique lanceolatum, maturitate carinis marginibusque induratis paleae anthoecii inferi amplexum ; lemma maturum tenuiter crustaceum, 5-nerve, tenuiter granulatum vel delicate transverse rugosum ; palea lemma aequans et ei similis, apice excepto marginibus angustis lemmatis amplexa. *Lodiculae* 2, minutae, glabrae. *Stamina* 3. *Styli* distincti ; stigmata lateraliter exserta. *Caryopsis* elliptico-oblonga, dorso compressa, hilo subbasali ; scutellum caryopsem dimidiam aequans.—Gramina annua vel perennia ; foliorum laminae lineares ; spiculae fasciculae inferiorum setis tenuibus mollibus suffultae vel setis substitutae vel (*H. canaliculatum*) inferiores aut omnes nudaе, et tunc axi nonnunquam in setam abeunte.

Species 2, in East Africa, South India and Ceylon. Type species, *H. canaliculatum* (Nees) Stapf et Hubbard.

Gramen annuum, culmis erectis ; ligula membranacea, ad 2 mm. longa ; spicularum fasciculae inferiores multisetosae vel omnino ad setas flavas redactae ; lemma anthoecii inferi 9-13-nervium ; anthoecium superum acuminatum.....1. *H. transiens*.

Gramen perenne, culmis e basi nodulosa plerumque geniculato-ascendentibus ; ligula ad seriem ciliorum redacta ; spicularum fasciculae omnino nudaе vel seta terminatae ; lemma anthoecii inferi 5-7-nervium ; anthoecium superum acutum.....

2. *H. canaliculatum*.

1. ***H. transiens*** Stapf et Hubbard, comb. nov.—*Setaria transiens* K. Schum. in Engl. Pflanz. Ost-Afr. C. 105 (1895).

KENYA COLONY : Masai highlands, Fischer l. 92 !

2. ***H. canaliculatum*** Stapf et Hubbard, comb. nov.—*Panicum canaliculatum* Nees in Wight Cat. 95, n. 1624 (1833) nomen ; Steud. Syn. Pl. Glum. i. 55 (1854) ; Hook. f. Fl. Brit. Ind. vii. 43 (1896) et in Trimen, Fl. Ceyl. v. 144 (1900). *P. Myurum* Wight ex Steud. l.c. *P. stenostachyum* Thw. Enum. Pl. Zeyl. 436 (1864) ; Trimen, Cat. Pl. Ceyl. 105 (1885). *Aira interrupta* Rottl. ex Steud l.c.

KENYA COLONY : Mombasa, Boivin ! INDIA : South Deccan Peninsula, Wight 1624 ! CEYLON : Jaffna, 8th Jan. 1796, Herb. Rottler ! Trincomalee, Glenie (C.P. 3845) ! Hambantota, near sea, Alston 1913 !

This species, together with *Panicum nodosum* Kunth (now referred to *Hemigymnia*), forms a section "*Breviglumae*" in Hook. f. Fl. Brit. India. As one of us has pointed out in Prain, Fl. Trop. Africa, ix. 742, the circumstances that the glumes of both species are of about equal length and at the same time so short that the greater part of the back of the fertile floret is exposed, suggest indeed at the first glance affinity, but neither the habit nor the structure of the spikelet, except for the character alluded to, supports this view. The presence of a minute bristle was apparently overlooked by Hooker, and in fact in those specimens which he had for examination the bristle is very obscure; somewhat similar cases are met with in species of *Setaria*, such as *S. Thollonii* Stapf. The bristles of *H. transiens* are very fine and resemble those of *Pennisetum* rather than of *Setaria*.

#### XLIV.—PLANTS NEW TO ASSAM: I. G. H. SPARE AND C. E. C. FISCHER.

Collections of plants from the less known parts of the Province of Assam in North East India having come to hand for determination, it is believed that it will be useful if such as are in themselves new or new to the locality are brought together. The area covered includes the civil Districts of Sylhet, Cachar, Goalpara, Kamrup, Darrang, Nowgong, Sibsagar and Lakhimpur, together with the Garo, Khasia, Jaintia, Naga, Manipur and Lushai Hill tracts and the Mishmi and Abor countries.

No general flora confined to Assam has been published, and for a knowledge of the plants found in the province recourse must be had to the Flora of British India and to sundry scattered papers, particularly in several issues of the Records of the Botanical Survey of India. The species to be included in this series, besides those described for the first time, are such as are not mentioned in any of the above quoted publications as having been found definitely in Assam.

##### **Anemone polyanthes** Don [Ranunculaceae].

Known from the Himalayas from Kashmir to Sikkim.

Mishmi, Delei Valley, 13,000-14,000 ft., June, *Kingdon Ward* 8334, "Flowers cream, tinged with green, probably owing to the cold. On steep brown-turf slopes facing South."

##### **Thalictrum elegans** Wall. [Ranunculaceae].

Known from the Himalayas from Hazara to Sikkim.

Mishmi, Delei Valley, 5000-6000 ft., July, *Kingdon Ward* 8433, "3-4 ft. high, growing in thickets and high herbaceous vegetation on the sunny side of the valley where the slope is very steep and rocky."

**Ranunculus hyperboreus** Rottb. var. **radicans** Hook. f. & T. [Ranunculaceae].

Known from the Himalayas from Kashmir to Sikkim and W. Tibet.

Mishmi, Delei Valley, 11,000–12,000 ft., June, *Kingdon Ward* 8354, "Flowers bright-yellow. On moss-clad rocks and cliffs in gullies : also on open grassy slopes in the forest area."

**Ranunculus diffusus** DC. [Ranunculaceae].

Known from the Himalayas from the Chenab to Bhutan ; the higher mountains of Peninsular India, Sumatra and Java.

Mishmi, Delei Valley, 5000–6000 ft., May, *Kingdon Ward* 8149, 8152, "Flowers golden-yellow. In stony pastures and in masses by streams in shade. Sends out long rooting runners and forms colonies " ; 8000–10,000 ft., June, *Kingdon Ward* 8303, " Amongst bush vegetation in steep gullies in the rain forest."

**Caltha palustris** Linn. [Ranunculaceae].

Widespread in all temperate regions ; Himalayas from Kashmir to Nepal.

Mishmi, Delei Valley, 12,000–13,000 ft., June, *Kingdon Ward* 8338, "Flowers bright-yellow. On steep muddy turf slopes with Southern aspect." Delei Valley, 13,000–12,000 ft., July, *Kingdon Ward* 8423, 8513, "Flowers golden-yellow. On alpine turf slopes."

var. **purpurea** *Spreng. & Fisch.*, var. nov., with magenta petals.

Kaso, Delei Valley, 12,000 ft., July, *Kingdon Ward* 8409, "On alpine meadow slopes amongst scrub" ; Delei Valley, 11,000–12,000 ft., Aug.-Sept., *Kingdon Ward* 8616, "In steep gullies, south slopes, amidst high herbage."

**Trollius Farreri** *Stapf* [Ranunculaceae].

Found in W. China by Farrer.

Mishmi, Delei Valley, 11,000 ft., June, *Kingdon Ward* 8315, "Flowers golden-yellow. On grassy slopes of gullies facing North."

**Isopyrum adiantifolium** *Hook. f. & T.* [Ranunculaceae].

Known from Sikkim.

Mishmi, Delei Valley, 7000–8000 ft., June, *Kingdon Ward* 8302, "Petals snow-white. Amongst bush herbage in steep gullies in the rain forest."

**Paraquilegia grandiflorum** *Drumm. & Hutch.* [Ranunculaceae].

Known from the Himalayas from Kumaon to Balti and in Siberia.

Mishmi, Delei Valley, 10,000–11,000 ft., May, *Kingdon Ward* 8249, "A dark-flowered form with deep-violet petals. Hanging in bunches from the granite cliffs in shade where there is perpetual dripping water."

**Magnolia Campbellii** *Hook. f. & T.* [Magnoliaceae].

Known from Sikkim and Bhutan.

Mishmi, Delei Valley, 8000–9000 ft., Sept.-Oct., *Kingdon Ward* 8629, 8723, "The trunk usually splitting into several branches almost from the ground, often hollowed out below as though supported on flying buttress roots. In bud only up to 25th Oct., fairly common scattered in the forest in the damper hollows where bamboos grow thickly. Damp clayey soil."

**Magnolia globosa** Hook. f. & T. [Magnoliaceae].

Known from Sikkim.

Mishmi, Delei Valley, 9000 ft., June, *Kingdon Ward* 8297, "In steep gullies and on the flanking ridges among trees."

**Schizandra propinqua** Hook. f. & T. [Magnoliaceae].

Known from the Himalayas from Nepal to Kumaon.

Mishmi, Delei Valley, 2000 ft., April, *Kingdon Ward* 8009, "Perianth segments pale-yellow, the innermost tinged with cherry-red at the base, staminal cone cherry-red. A big climber in the jungle."

**Schizandra sphenanthera** Rehd. & Wils. [Magnoliaceae].

Recorded from China.

Mishmi, Delei Valley, 8000–9000 ft., May, *Kingdon Ward* 8210, "Flowers deep cherry-red, fruit in short compact purple hanging spikes. A big rambling climber on the edge of the rain forest on the ridge."

**Podophyllum versipelle** Hance (Berberidaceae).

Known from China.

Mishmi, Delei Valley, 10,000 ft., flowering in May, *Kingdon Ward* 8265, "Flowers white. In the Rhododendron-conifer forest."

**Mahonia calamicaulis** Spare & Fisch., sp. nov. [Berberidaceae]; *M. eurybracteata* Fedde affinis, stipulis nullis, foliolis ovato-lanceolatis vel ellipticis apice caudato-acuminatis, spinulis marginis pluribus, bracteolis linearibus, sepalis 9, petalis apice bilobis, antheris quam filamenta valde brevioribus differt.

*Undershrub* 2–3 ft. high, quite glabrous. *Stem* terete, yellowish-brown, shining, marked with the scars of fallen leaves and resembling the stem of a *Calamus*, below bearing a few broadly triangular, acute scales 7–18 mm. long. *Leaves* imparipinnate, aggregated near the end of the stem; rhachis terete, deeply sulcate, base semi-amplexicaul, 15–30 cm. long, swollen and articulate at the insertion of the leaflets, exstipulate. *Leaflets* coriaceous, 4–7 opposite pairs, sessile, when dry brown above, paler and subglaucous below, usually enlarging upwards with the terminal largest, but sometimes middle ones largest and diminishing in both directions, sometimes with a pair of leaflets of the smallest size 5 mm. from the base of the rhachis, at others the lowest pair up to 10 or 12 cm. from the base and of medium size, lateral leaflets ovate-lanceolate, caudate-acuminate, base cuneate, inequilateral, 3–9.5 cm. long, 1.3–4 cm. wide, margins

slightly revolute, the lower third entire the rest repand spinulose-dentate except for the acumination which is entire, teeth 5-9 on each side, one side usually with 1 more than the other; terminal leaflet elliptic, caudate-acuminate, apex spinulose acute or blunt and suddenly spinulose, base cuneate, equilateral 7.5-11.5 cm. long, 2.5-5.5 cm. wide, the midrib of all leaflets slightly impressed above, prominent below, primary nerves 5-7, ascending, not prominent. *Inflorescence* terminal, of several dense-flowered racemes, sometimes with a small branch near the base, 6-12 cm. long; peduncle flattened, about 2 cm. long, arising from imbricating, rigid, triangular, acute scales up to 1.7 cm. long; bracts at the forks and lower bracteoles lanceolate from a broad semi-amplexicaul base, 8-9 mm. long, upper bracteoles linear-lanceolate, acuminate, about 6 mm. long. *Flowers* solitary or twin, pedicels 4-5 mm. long. *Sepals* 9, broadly obovate, rounded, 4-5 mm. long, outermost smaller. *Petals* 6, narrowly obovate, 5 mm. long, 2-glandular at the base within, apex shortly 2-lobed, lobes obtuse. *Stamens* 6, 3.5 mm. long; anthers about half the length of the stout filaments. *Ovary* ellipsoid, 3 mm. long; ovules 4; stigma sessile, depressed capitate. *Fruit* not seen.

Assam, Delei Valley, 7000-8000 ft., April, *Kingdon Ward* 8058, "A dwarf, erect undershrub of the temperate rain forest, growing in shade under the trees along the ridges. Flowers bright-yellow, fragrant. Leaves very hard and leathery."

In the Herbarium at Kew there is a twig without flowers or fruit from Bhutan (collector unknown) which we consider to be identical with this species.

***Meconopsis aculeata* Royle** [Papaveraceae].

Reported from the Himalayas from Kashmir to Kumaon.

Mishmi, at Kaso in the Delei Valley, 12,000-13,000 ft., July, *Kingdon Ward* 8420, "A single plant found on an earth slide facing South."

***Meconopsis paniculata* Prain** [Papaveraceae].

Known from Nepal, Sikkim and Bhutan.

Mishmi, at Kaso in the Delei Valley, 13,000-14,000 ft., July, *Kingdon Ward* 8425, "Not common, scattered amongst alpine meadow plants or scrub on the South face of the ridge, where it is scarped into high cliffs."

***Dactylicapnos scandens* Hutch.** [Fumariaceae].

Known from the Himalayas from Garhwal to Nepal.

Mishmi, Delei Valley, 8000-9000 ft., Sept., *Kingdon Ward* 8649, "Flowers almost orange, fruit red. Scrambling over bushes in open parts of the rain forest."

***Loxostemon pulchellus* Hook. f. & T.** [Cruciferae].

Reported from Sikkim.

Mishmi, at Kaso in the Delei Valley, 12,000 ft., July, *Kingdon Ward* 8442, "Flowers purple. On earth slopes and rock outcrops."

***Sisymbrium himalaicum* Hook. f. & T. [Cruciferae].**

Known from the Himalayas from Kashmir to Sikkim.

Mishmi, at Kaso in the Delei Valley, 12,000 ft., July, *Kingdon Ward* 8441, "Flowers mauve. On earth slopes and rock outcrops."

***Viola biflora* Linn. [Violaceae].**

Known from Temperate Europe and Northern Asia ; Himalayas from Kashmir to Sikkim.

Mishmi, Delei Valley, 11,000–14,000 ft., June, *Kingdon Ward* 8332, 8360, "Along the rocky knife-edge ridge in turf and on grassy slopes under rocks or bamboos ; on earth slides in the open gullies."

var. ***hirsuta* Spare & Fisch.**, var. nov., much more hairy and with narrower spur.

Delei Valley, 11,000–12,000 ft., July-Aug., *Kingdon Ward* 8430, 8631, "On earth slopes and rock outcrops in gullies."

***Viola Hookeri* T. Thoms. [Violaceae].**

Known from Bhutan and Sikkim.

The description in the Fl. Brit. India i. 183 of this species is meagre and to a certain extent misleading as it includes, as therein apprehended, 2 separate species. It is desirable therefore to publish the fuller description which follows :—

*Herb*, glabrous or nearly so. *Rootstock* usually elongate, slender or rather thick and warted ; stolons when present, slender, long or short. *Leaves* radical, orbicular-reniform to ovate-cordate, apex rounded rarely subacute, basal sinus deep, moderately wide or lobes touching or overlapping, 1.5–4 cm. long, 1.5–3.6 cm. wide, margins broadly and evenly crenate, the upper end of the crenatures deeply indented and usually with a small rounded point, base with 2 spreading primary nerves on either side and 2 or 3 pairs above, all arching and anastomosing, not prominent, both faces quite glabrous and dotted with minute glands ; petioles slender, not winged, up to 10 cm. long ; stipules gland-dotted, lanceolate, acuminate, toothed or lacerate, up to 1.3 cm. long, the apex and ends of the teeth or divisions glandular. *Peduncles* slender, 1-flowered, up to 7 cm. long, furnished a little distance below the flowers with 2 linear, gland-dotted bracts up to 5 mm. long, apex and a few linear basal teeth gland-tipped. *Flowers* up to 1 cm. long, white, the lower petal shorter and purplish or veined with purple. *Sepals* narrowly-lanceolate or linear ensiform, acute, gland-dotted and gland-tipped, 5 mm. long, nerves obscure, margins very narrowly scarious, with the petals very minutely puberulous (observable only under magnification). *Spur* saccate. *Ovary* gland-dotted ; style narrowed downwards from the obscurely beaked stigma. *Capsule* about 5 mm. long, valves apiculate, green, covered with reddish-brown (when dry) glands. *Seeds* not seen.

Bhutan, *Griffith* 233 ; Sikkim, Lachen 7000–10,000 ft., July-Aug., *J. D. Hooker* ; Lagle, 9000 ft., May, *C. B. Clarke* 27750A ; Yakla, 9000 ft., May, *C. B. Clarke* 27845 ; Tonglo, 9000 ft., June, *C. B.*

*Clarke* 35734; Assam, Delei Valley, Chibaon, 8000 ft., April, *Kingdon Ward* 8063, "In grassy dells, shaded by scattered trees"; 7000–8000 ft., June, *Kingdon Ward* 8301, "In clumps on moss-lined rocks and precipitous banks in the rain forest. Heavily shaded moist positions"; 9000–10,000 ft., Aug. (in fruit), *Kingdon Ward* 8563, "On forested slope in heavy shade. Grows in clumps when the leaf-mould is always damp."

***Viola Hediniana* Becker** [Violaceae].

Collected previously in Yunnan.

Mishmi, Delei Valley, 10,000–11,000 ft., Aug., *Kingdon Ward* 8564, "Flowers bright yellow; stems erect. On earth slopes and gneiss cliffs and outcrops in the open gullies facing North."

***Viola moupinensis* Franch.** [Violaceae].

Known from N. Burma and W. China.

Mishmi, Delei Valley, 12,000 ft., June, *Kingdon Ward* 8287, "Flowers pale-violet with darker lines. Scattered over steep North slope below the ridge under the shadow of *Rhododendron* bushes, but not in shade."

***Viola pogonantha* W. W. Smith** [Violaceae].

Collected previously in Yunnan.

Mishmi, Delei Valley, 6000 ft., April, *Kingdon Ward* 8136, "Flowers mauve or pale-violet. On shady banks, often by streams."

***Polygala Mariesii* Hemsl.** [Polygalaceae].

Previously found in W. China.

Mishmi, Delei Valley, 2000 ft., April, *Kingdon Ward* 8015, "A rounded bush 5 ft. high. Flowers opening yellow turning purple. Amongst rocks and boulders on the river bank or in the bed just above flood-level."

***Lychnis multicaulis* Wall.** [Caryophyllaceae].

Known from the Himalayas in Nepal, Kumaon and Sikkim.

Mishmi, Delei Valley, 7000–8000 ft., Sept., *Kingdon Ward* 8653, "On open South slopes among grass, bracken, *Epilobium*, etc."

***Lychnis nigrescens* Edgew.** [Caryophyllaceae].

Known from Sikkim.

Mishmi, Delei Valley, 11,000 ft., Oct., *Kingdon Ward* 8714, "Flowers cream streaked with pink. In nooks on the cliffs."

***Hypericum oblongifolium* Choisy.** [Hypericaceae].

Himalayas in Kumaon.

Mishmi, Delei Valley, 11,000–12,000 ft., Aug., *Kingdon Ward* 8617, "An undershrub with large golden-yellow flowers. On rocky outcrops facing South, amongst bamboos."

***Sarauja subspinosa* Anth.** [Theaceae].

Collected previously in China.

Mishmi, Delei Valley, 4000 ft., July, *Kingdon Ward* 8485, "A tall ungainly shrub, hardly 20 ft. high, in secondary thickets. Flowers pale-pink in large bunches all up the old wood."

**Argostemma fragile** *Geddes* [Rubiaceae].

Obtained only in Siam.

Southern Lushai Hills, 2000-4000 ft., June-Aug., *Rev. W. J. L. Wenger* 221A, "On wet rocks."

**Dichrocephala minutiflora** *Van.* [Compositae].

Known from Yunnan.

Lushai Hills, Koladyne River, 2000 ft., Jan., *Mrs. N. E. Parry* 583, "Flowers bright-mauve. Plant strongly aromatic."

**Leucomeris decora** *Kurz* [Compositae].

Previously recorded from Burma and China.

Manipur, 3500 ft., April, *G. Watt* 6261, "In woods above Lareen"; Lushai Hills, Chakang in the Lakher country, 5000 ft., flowers in Feb., *Mrs. N. E. Parry* 122, "Medium-sized tree; flowers fragrant." There are also specimens in the Herbarium at Kew from Siam.

**Rhododendron Veitchianum** *Hook.* [Ericaceae].

Collected in S. Burma.

Lushai Hills, Pongpui, 6000 ft., flowers Feb., *Mrs. N. E. Parry* 1, 146. No. 1 was epiphytic, No. 146 a terrestrial large shrub.

**Didymocarpus adenocarpa** *C. E. C. Fischer*, sp. nov. [Gesneraceae]: *D. purpureo-bracteatae* *W. W. Smith* peraffinis, foliis leviter cordatis subtus sparse pubescentibus atque glandulosis, bracteis connatis, floribus cum dentibus calycinis brevioribus atque numerosioribus, staminodiis 2-3, disco apice lobato, ovario fructuoso glanduloso differt.

A low herb; stem 10 cm. or more long, brown, sparsely brown pubescent upwards with multicellular hairs. *Leaves* all caulescent, membranous, 2-3 pairs, pairs often unequal, oblong, acute or abruptly acutely cuspidate, base shallowly cordate, 9-15 cm. long, 5-8 cm. wide, yellowish above, pale below, sparsely pubescent on both faces and ciliate with white multicellular hairs, rather densely dotted below with minute globose, pale-brown, glistening glands, primary nerves 8-10 pairs, margins coarsely crenate-dentate; petioles 1.5-3 cm. long, brown-pubescent with multicellular hairs. *Inflorescence* of axillary cymes; peduncles slender, 3-4 cm. long, sparsely brown-pubescent below, glabrous upwards, trichotomously branched; branches 0.75-2 cm. long, the central 1-flowered, the lateral again trichotomously branched; bracts at the forks 2, suborbicular, obtuse, connate to half-way or less, 5-7 mm. long, reddish-brown, glabrous; pedicels slender, glabrous, 5 mm. long. *Flowers* up to about 20 in the cyme, glabrous. *Calyx* narrowly funnel-shaped, reddish-brown, 0.8-1 cm. long, with 5-9, short, blunt, broadly triangular teeth with a vein running into each. *Corolla*



3 cm. long, tube cylindric, slightly widened to the mouth, white tinged with pink, 2-lipped, lobes semi-circular, the 3 lower rather larger than the 2 upper, deep pink. *Stamens* 2, inserted  $\frac{1}{2}$  of the length of the tube from the mouth of the corolla; anthers in the mouth, coherent. *Staminodes* 2 or 3, inserted lower than the stamens, 2 upper nearly as long as the stamens, filiform, bifurcate near the apex, the third when present below the others and much shorter, simple. *Disc* cylindric, 2 mm. long, mouth lobed. *Ovary* linear, slightly widened upwards, covered with globose yellow glands; style comparatively stout; stigma large, peltate, pubescent above. *Capsule* linear, brown, 3-3.5 cm. long including the slender stipe and persistent style, valves dotted with glistening yellowish glands. *Seeds* very minute, pale-reddish-brown, fusiform, acute at both ends.

Assam, Southern Lushai Hills, 4500 ft., Sept., *W. J. L. Wenger* 239, "In shady forests."

#### **XLV.—NEW SPECIES FROM THE MALAY PENINSULA AND BORNEO. H. N. RIDLEY.**

***Millettia cuspidata* Ridley** (Leguminosae); affinis *M. sericeae* Benth., foliis subtus haud fulgentibus, oblongis cuspidatis, calyce brevioris latioris, carina et vexilli dorso aureo-hirtis differt.

*Herba* scandens glabra. *Folia* 18-20 cm. longa; foliolis oppositis 6, tenuiter coriaceis glabris oblongis longe cuspidatis basibus obtusis, nervis 5-paribus inarcuantibus subtus elevatis nervulis reticulationibusque conspicuis, 8.5 cm. longis 3 cm. latis (cuspidate 1.7 cm. longo). *Panicula* axillaris 20 cm. longa laxa ramis dissitis 8-12 cm. longis pubescentibus. *Flores* copiosi pallide rosei, pedicellis 1 mm. longis, calyce campanulato dense hirtis 3 mm. longo, dentibus brevissimis, vexillo orbiculari unguiculato extra aureo-sericeo intus glabro roseo, carina subaequilonga dense aureo-sericea, alis oblongis unguiculatis glabris, ovario oblongo pubescente.

BORNEO: Sarawak, in Matang Woods, Jan. 1915, *Ridley*. "Flowers pinkish."

This species is allied to *M. sericea* Benth., but differs in the oblong long-cuspidate leaflets not fulgent beneath; the calyx is shorter and broader; the carina is covered with golden silky hairs, as is the back of the vexillum.

***Spatholobus strigillifer* Ridley** (Leguminosae); *S. roseo* Prain approximatus, sed undique glaber, foliolis coriaceis ovatis magnis, legumine sublignoso magno cultriformi.

*Frutex* scandens. *Folia* trifoliolata foliolis oblongis vel ovatis acutis basibus rotundatis, glabris coriaceis, nervis subtus elevatis 6-paribus, 9-14 cm. longis 4.5-10 cm. latis, petiolulis 8 mm. longis, rhachide producta 3 cm. longa, stipellis linearibus acuminatis 2 mm. longis, petiolis 6 cm. longis. *Panicula* 30 cm. longa patens, adulta glabra, ramis 11 cm. longis dissitis; *floribus* albis, pedicellis gracillimis 4 mm. longis; *calycis* tubo urceolari lobo supremo lato brevissime

bilobo, ceteris brevissimis ovatis; *corolla* 5 mm. longa, *vexillo* 5 mm. lato rotundato striato, *carina* brevior obtusa; *stamine* vexillari libero, ceteris filamentis gracilibus basi connatis; *ovario* cylindrico ovulis 2, stylo gracili, stigmate minuto. *Legumen* falcatum crassum lignosum reticulatum, margine incrassato, apice rotundato, 12 cm. longum, 3 cm. latum.

BORNEO: Sarawak, Kuching, *Haviland* 1974, and Rejang Sibul, *Haviland* 2897; Matang, Jan. 1915, *Ridley* (type); *Beccari* 2990.

This species is perhaps as near *S. roseus* Prain as any. It is remarkable for its large coriaceous ovate leaflets which in young branches are smaller and oblong, and for its very stiff almost woody falcate fruits which are just the shape of a boomerang.

***Dialium angustisepalum* Ridley** (Leguminosae); affine *D. patenti* Bak. sed sepalis anguste lanceolatis acuminatis differt.

*Arbor.* *Folia* 5-foliolata, foliolis ellipticis cuspidatis basibus rotundatis vel breviter cuneatis, coriaceis glabris, nervis vix conspicuis 10-paribus, 6–7 cm. longis 3–4.5 cm. latis, petiolulis crassis 5 mm. longis. *Panicula* laxa 10–20 cm. longa, ramis patentibus puberulis; *sepalis* lanceolatis acuminatis 4 mm. longis puberulis; *petalis* nullis; *ovario* cylindrico conico pubescente 2 mm. longo, stylo aequilongo.

MALAY PENINSULA: Pahang, Kuantan, Gunong Lesang, Native Coll. *Yusop* 4123 (type): Bukit Buserah, *F. G. Yeop* 846. Nat. Name "Kranji Burong."

This species is undoubtedly closely allied to *D. patens* Baker, for which I mistook it, but is very distinct in the narrow lanceolate sepals, narrowing upwards from a broader base.

***Dialium Havilandii* Ridley** (Leguminosae); affine *D. platysepalum* var. *ambiguum* Bak. sed foliolis 9–15, sepalis latioribus ovatis, ovario velutino, drupa subpyriformi.

*Arbor.* *Folia* 15 cm. longa, foliolis 9–15 coriaceis oblongis cuspidatis basi obtusis superne glabris subtus pallidioribus puberulis, nervis 10-paribus inarquantibus vix prominulis, nervulis plurimis cum reticulationibus papillatis, 5–7.5 cm. longis, 2–2.5 cm. latis, petiolulis 4 mm. longis transverse rugosis. *Panicula* valida 18 cm. longa, ramis 11 cm. longis hirtis; *bracteis* 1 mm. longis ovatis; *pedicellis* crassis aureo-pubescentibus 4 mm. longis, alabastris ovoideis aureo-pubescentibus; *sepalis* ovatis undique pubescentibus 5 mm. longis; *staminibus* 2, antheris lineari-oblongis 3 mm. longis; *ovario* oblongo velutino brevi, stylo velutino. *Drupa* ovato-pyriformis atrobrunnea pubescens 3 cm. longa 1.5 cm. lata.

BORNEO: Sarawak, *Beccari* 2517, 2949; Kuching, Feb. and Sept. 1892, *Haviland* 1700 (type), 2283. "Calyx brown velvety, anthers yellow, filaments white."

This species is allied to *D. platysepalum* Baker but the sepals are much broader and ovate, the ovary hairy and the leaflets more numerous. All of this set of *Dialium* are closely allied.

**Bauhinia cancellata** Ridley (Leguminosae); *B. foraminiferae* Gagnep. approximata sed foliis multo majoribus integris vel breviter bifidis subtus hirtis, floribus minoribus purpureis, petalis oblongis ad basin angustatis, marginibus crispatis nec spathulatis, disco hirtio, stamine fertili 1, stylo brevior crasso distincta.

*Frutex* scandens. *Rami* flexuosi angulati. *Folia* coriacea minute cancellato-reticulata ovata integra vel breviter biloba obtusa superne glabra, subtus nervis elevatis 6-7-paribus rufo-hirtis, 5-6 cm. longa, 4-5 cm. lata, petiolis gracilibus rufo-hirtis 3 cm. longis. *Flores* purpurei breviter racemosi; pedicellis gracilibus 3 cm. longis; *calycis* tubo brevi obconico 2 mm. longo, sepalis 3 coriaceis ovatis obtusis glabris 3 mm. longis, *petalis* oblanceolato-oblongis obtusis marginibus crispatis basibus angustatis, dorso parce rufo-hirtis, 5 mm. longis 1.5 mm. latis; *stamine fertili* glabro filamento basi incrassato superne attenuato, anthera globosa, *sterilibus* 3; *ovario* fusiformi stipite aequilongo, stylo crasso brevi, stigmate magno bilobo, disco rufo-hirtio.

MALAY PENINSULA: Negri Sembilan, Gunong Angsi, west side, 2600 ft. alt., Nov. 20, 1923, *Mohamed Nur* 11559.

This species is most nearly allied to *B. foraminifera* Gagnepain, of Sarawak, Borneo, but it differs in the larger leaves more shortly bilobed, usually for not more than one third of their length, and often quite entire and more coriaceous. The flowers are much smaller with narrow oblong purple crisped petals, not spathulate and broad as in *B. foraminifera*; and on the disc at the base of the ovary is a tuft of red hairs, absent in all the allied species.

**Bauhinia rosulenta** Ridley (Leguminosae); affinis *B. cardiophyllae* Merrill, sed foliis majoribus, plurivenosis, subtus hirtis, inflorescentia hirtula petalis oblongo-oblanceolatis, ovarii stipite et dorso rufo hirtis.

*Frutex* scandens. *Folia* coriacea subtus glaucescentia, ovato-cordata integra basibus paullo emarginatis superne glabra subtus parce rufo-hirta, nervis 11 rufo-hirtis, 6 cm. longa 7 cm. lata, petiolis 3 cm. longis rufo-hirtis. *Racemi* multiflori 5 cm. longi, rufo-hirti, *pedicellis* gracilibus hirtis 4 cm. longis; *alabastris* globosis; *calycis* tubo 3 mm. longo cylindrico, lobis lanceolatis 3 mm. longis; *petalis* oblongis oblanceolatis basi attenuatis marginibus cristatis, 1 cm. longis 2 mm. latis, rosulentis; *staminibus* 8, quorum 6 inferilibus, 2 antheriferis, antheris subglobosis; *ovario* fusiformi stipite et dorso dense longe rufo-hirsuto, *stylo* aequilongo glabro, stigmate subgloboso magno.

BORNEO: Sarawak, near Kuching, *Haviland* 927. "Petals pinkish, base of filaments red."

Allied to *B. cardiophylla* Merrill, but the leaves are not distinctly cordate and are larger, the nerves more numerous and like the back of the leaf red-hairy; the inflorescence is also hairy, the petals narrower, oblanceolate; the stalk of the ovary is covered with long red hair continued part way along the back of the ovary.

**Leucostegane grandis** Ridley (Leguminosae); differt a *L. latistipulata* Prain foliis majoribus bijugis, sine stipulis latis, floribus multo majoribus roseis legumine magno.

*Arbor.* Folia bijuga, foliolis 4 oppositis glabris coriaceis oblongis vel ellipticis acute abrupte acuminatis basibus paulisper inaequalateralibus nervis inconspicuis circiter 12-paribus, secundariis subaeque conspicuis, gracillimis, 6–15 cm. longis 3–6 cm. latis, petiolis 5 mm.–1 cm. longis. Racemi vel paniculae cauliflori congesti 4–5 cm. longi puberuli, bracteis ovatis acuminatis ciliatis 2 mm. longis; floribus dissitis roseis, pedicellis 1 cm. longis; sepalis 5, obovatis obtusis carnosus marginibus ciliatis, 1.2 cm. longis 4 mm. latis; petalis minimis ovatis acutis pubescentibus hirtulis carnosus; staminum filamentis ad bases dilatatis quasi alatis superne angustatis, antheris oblongis; ovario cylindrico hirto, stylo glabro aequilongo, stigmate minuto. Legumen ensiforme curvatum apicem versus dilatatum, 26 cm. longum 5 cm. latum, seminibus complanatis 5.

BORNEO: Kuching in Sarawak, Haviland 1799.

The genus *Leucostegane* Prain is based on a single species found by me in the Dindings, Malay Peninsula. The new species differs from that in the much greater size of all parts, leaves, flowers, pod and seeds; there are only two pairs of leaflets to the leaf, instead of 6, and the large stipules are wanting.

**Crudia Beccarii** Ridley (Leguminosae); affinis *C. bantamensis* Koorders sed foliis acuminatis, floribus longius pedicellatis differt.

*Arbor.* Folia 4-foliolata, glabra, foliolis oblongo-oblancoelatis cuspidatis basibus obtusis coriaceis subtus glaucescentibus nervis 6-paribus inarcuantibus, 10–14 cm. longis 5 cm. latis, petiolulis 5 mm. longis crassis. Racemus 13 cm. longus, floribus dissitis, bracteis minutis ovatis acutis hirtis, pedicellis 3 mm. longis; sepalis obovatis 3 mm. longis in alabastro puberulis, tubo calycis brevi obconico; staminibus 10 filamentis 5 mm. longis antheris ovoideis; ovario oblongo-ovoideo dense hirto 3 mm. longo, stylo glabro 6 mm. longo.

BORNEO: Sarawak, Beccari 3903.

This species, allied to *C. bantamensis* Koorders, of Java, differs in having acuminate leaves and longer pedicels to the flower.

**Crudia velutina** Ridley (Leguminosae); affinis *C. Evansi* Ridl. sed multo magis velutina, pedicellis longioribus sepalis angustioribus lineari-lanceolatis staminibus brevibus.

*Arbor.* Rami albescentes. Folia 2–4-foliolata, folia juniora undique velutina, foliolis coriaceis superne glabris subtus velutinis, ellipticis obtuse acuminatis, basibus obtusis nervis 18-paribus, 10–18 cm. longis 5–8 cm. latis, petiolis crassiusculis 1 cm. longis. Racemi 10–11 cm. longi axillares, bracteis minutis ovatis acuminatis dense pubescentibus, pedicellis crassiusculis velutinis 2 mm. longis; alabastris oblancoelatis; sepalis lineari-lanceolatis crassis extra hirtis 3 mm. longis; staminibus 10, filamentis glabris, antheris oblongis

sepalis brevioribus ; ovario 4 mm. longo dense hirtio oblongo-conico, stylo 4 mm. longo glabro.

BORNEO : Sarawak, Bintulu, April 1893, *Haviland* 3071.

Allied to *C. Evansi* Ridley, of Pahang, but the whole plant much more velvety, the pedicels longer, the sepals narrower and linear-lanceolate ; the stamens appear to be unusually short.

**Begonia Yappii** Ridley (Begoniaceae) ; affinis *B. Forbesii* King sed planta major petalis nullis differt.

*Herba.* *Rhizoma* repens crassiusculum. *Folia* ovata breviter acuminata basi rotundata subaequaliter breviter biloba, marginibus cum nervis tenuibus 6-8, subtus rufo-hirta, 5.5-6 cm. longa, 3.5-5.5 cm. lata, petiolis 2-9 cm. longis hirtis. *Panicula* gracilis 11 cm. longa glabra, ramis 2-3 paucifloris 2-3 cm. longis. *Flores* parvi albi : *masculi* sepalis 2 rotundatis 5 mm. latis, petalis nullis, androecii globosi stipite conico, antheris brevibus oblongis ; *feminei* sepalis iis masculi similibus, stylo triramoso. *Capsula* triptera alis aequalibus oblongo-lanceolatis acuminatis obtusis, 5 mm. longis.

MALAY PENINSULA : Kelantan, Kwala Aring, *Yapp* 25.

Allied to *B. Forbesii* King, but that species has 2 petals, which appear to be totally missing from this plant.

**Ophiorrhiza longe-repens** Ridley (Rubiaceae) ; *O. fontinalis* Ridl. approximata sed caulibus elongatis sublignosis repentibus adscendentibus, foliis parvis subcoriaceis, floribus paucis, lobis corollae lanceolatis valde distincta.

*Suffrutex* repens elongatus. *Caulis* gracilis fragilis 26 cm. longus superne puberulus. *Folia* subcoriacea ovata obtusa basi rotundata vel cuneata, marginibus saepe ciliatis, ceterum glabris, nervis 5-paribus inarquantibus, 1.5-2 cm. longa ; petiolis gracilibus 5 mm. longis. *Cymae* axillares pubescentes pauciflorae, pedunculis 2 cm. longis gracilibus, pedicellis 2 mm. longis ; *calyce* campanulato lobis brevissimis lineari-lanceolatis ; *corolla* 7 mm. longa alba, tubo gracili 5 mm. longo, lobis lanceolatis acutis 2 mm. longis ; *staminibus* inclusis. *Capsula* obtriangularis vix retusa, 2 mm. longa, 7 mm. lata, glabra.

MALAY PENINSULA : Kelantan, Gua Panjang at Gua Ninik, in moss on limestone, *M. R. Henderson* 19524. "Flowers white."

This species is not clearly related to any known to me, but in some respects resembles *O. fontinalis* Ridley. Its wiry brittle stems creep in the moss on the limestone rocks and ascend. The small leaves are rigid, smooth, slightly paler beneath, usually glabrous, but some have short stiff hairs on the edge ; the upper part of the stem is pubescent ; the flowers are elongate cylindric but small, with short lanceolate lobes. The fruit is much like that of *O. fontinalis*, the upper edge being nearly straight.

**Didymocarpus calcareus** Ridley (Gesneriaceae) ; affinis *D. castaneae-folio* Ridl., foliis longioribus angustioribus oblanceolatis hirtis, bracteis latioribus lanceolatis acuminatis dentatis distincta.

*Suffrutex*. *Caulis* lignosus. *Folia* terminalia lanceolata sub-patentia acuta, basi angustata marginibus dentatis, superne glabra ciliis paucis albescentibus in costa exceptis, subtus nervis elevatis 17-18-paribus cum costa parce albo-ciliatis, 10 cm. longa 4.5 cm. lata; petiolis 2 cm. longis. *Pedunculus* gracilis hirtus 10 cm. longus, *bracteis* 2-paribus dissitis lanceolatis acuminatis marginibus dentatis 1 cm. longis. *Sepala* lineari-lanceolata; *corollae* tubo 2 cm. longo lobis late rotundatis 1 cm. longis.

MALAY PENINSULA: Kelantan, Gunong Sitong, 1500 ft. alt. on limestone, *Mohamed Nur and Dr. Foxworthy* 12192. "Flowers pale blue."

This belongs to the set of *Didymocarpi* represented by *D. venustus* Ridley and *D. castaneaeifolius* Ridley in which the stem is woody and leafy at the top and the peduncles bear a pair or two pairs of foliaceous bracts, one of which is in the middle of the peduncle. In this species, the lower pair, which is the larger, had distinct dentation of the margin resembling that of the leaves.

**Codonoboea caelestis** Ridley (Gesneriaceae); affinis *C. leucocodon* Ridl. sed foliis multo majoribus hirtis herbaceis, nervis pluribus, floribus minoribus solitariis caeruleis, distincta.

*Suffrutex*. *Caulis* crassus lignosus 24 cm. longus superne densissime pilosus, pilis argenteis tectus. *Folia* oblanceolata basin versus gradatim attenuata subsessilia apice acuminata integra superne glabra subtus in marginibus, costa, nervisque 25-paribus albo-pilosa, 18 cm. longa 3 cm. lata. *Pedunculi* graciles basi albo-pilosi superne glabri 5 cm. longi uniflori, *bracteis* 2 lanceolatis obtusis glabris 3 mm. longis; *sepalis* ad basin liberis 3 mm. longis lineari-lanceolatis; *corolla* campanulata pallide caerulea 1.5 cm. longa, lobis brevibus oblongo-lanceolatis puberulis 5 mm. longis; *staminibus* 2 brevibus antheris subglobosis; *pistillo* glabro stigmate bilobo. *Capsula* cylindrica acuminata glabra 3 cm. longa.

MALAY PENINSULA: Kelantan, Sungei Keteh at Gua Ninik, *Henderson* 19683 (type). "Flowers pale blue." Sungei Keteh, plentiful along the riverside, *Mohamed Nur and Foxworthy* 11964.

This genus hitherto contained three species all from the region of Gunong Tahan in Pahang, at no great distance from Kelantan. This species has much smaller blue flowers than *C. leucocodon* and is very hairy. It curiously resembles the Borneo plant *Stilpnotherix* (*Didissandra*) in habit and general appearance, but the latter has four stamens. It has nothing to do with *Didissandra*, to which Clarke referred it, but is more allied to the *Boea* section of *Cyrtandraceae*.

**Boea brachycarpa** Ridley (Gesneriaceae); affinis *B. Kerrii* Craib, differt capsulis brevioribus crassiusculis stylo longo terminatis.

*Suffrutex*. *Caulis* elatus ultra 18 cm. altus ferrugineo-lanuginosus, internodiis 6 cm. longis. *Folia* opposita oblanceolato-obovata obtusa, basi attenuata, superne glabra subtus ferrugineo-

lanuginosa. *Paniculae* 3 lanuginosae laxae 30 cm. longae basi ramosae superne cymis oppositis remotis internodiis 4 cm. longis; *floribus* non visis. *Capsulae* 6 mm. longae cylindricae acuminatae subulatae dehiscentes tortae, in pedicellis 4 mm. longis filiformibus; *sepalis* linearibus basi dilatatis 2 mm. longis.

MALAY PENINSULA: Kelantan, Gua Ninik, M. R. Henderson 19668.

This species is allied to *B. Kerrii* Craib, of Siam, but differs in the very short and thick capsules with only one twist in dehiscence and terminated by a rather long persistent slender style. Except the very different *B. minutiflora* Ridley this has the shortest capsules of any species known to me.

**Geunsia anomala** Ridley (Verbenaceae); nulli speciei affinis; foliis magnis hirtis, floribus in spicis densis caulifloris, corolla brevi 4-loba, ovulis 2 pro loculo, distincta.

*Frutex* dense rufo-barbatus. *Folia* opposita chartacea obovata cuspidata basi acuta marginibus undulatis spinuloso-denticulatis, superne scabrido-hirta, subtus stellato-pilosa, nervis 8-paribus, 15-17 cm. longa 7.5-8 cm. lata, cuspidate 1 cm. longo, petiolis crassis 1.5 cm. longis dense rufo-barbatis. *Flores* in capitulis densis hirtis, *pedunculis* lignosis demum glabris, 2-7 cm. longis infra folia ortis, *bracteis* lanceolatis hirtis; *calyce* tubuloso dentibus 4 margine hirtis, 5 mm. longis; *corolla* paullo longiore, glandulosa, lobis 4 oblongo-ovatis; *staminibus* 4, antheris oblongis apice bifidis, filamentis brevibus, stylo elongato; *ovario* 4-loculari, ovulis in quoque loculo 2 erectis.

SARAWAK: Beccari 2759; Penkulu Ampat, young jungle, Haviland 760 (type).

This plant in its compact cauliflorous heads of flowers is unlike anything else, but it is suggested by Stapf, who has made many notes and drawings of structure on the specimens in the Kew Herbarium, that this is Briquet's *Geunsia Beccariana* in Engl. & Prantl, Pflanzenfam. iv. 3a, 165. It is possible that this was the plant he referred to, but as there is nothing more than the name, it is not worth perpetuating. Merrill quotes the above number of Beccari's as *Callicarpa Havilandi*, which it is not. This plant has the given characteristics of *Geunsia* to some extent, as defined by H. J. Lam, but there do not seem to me to be any characters sufficiently valid to separate the two genera; as this species, however, appears to have two ovules in each cell of the ovary it had better remain in *Geunsia*.

**Callicarpa barbata** Ridley (Verbenaceae); *C. basilanensi* Merrill approximata, sed foliis magnis barbatis, floribus in paniculis robustis longe pedicellatis glabris corolla 5-loba staminibus 5 distincta.

*Frutex*? hirsutissimus. *Folia* opposita chartacea magna obovata acuta basi longe attenuata, laminis ad bases petiolorum decurrentibus marginibus undulatis denticulatis, nervis 10-paribus, reticulationibus

subtus elevatis, superne pilis rufescentibus parce tectis, costis utroque latere rufo-barbatis, marginibus et nervis pilis plumosis rufo-hirsutis, 31 cm. longa 16 cm. lata. *Paniculae* in caulibus sub folia delapsa pilis stellatis et pubescentia tectae pedunculis ramisque 4-angulatis, 9 cm. longae 8 cm. latae, multiflorae, pedicellis 2 cm. longis gracilibus, *bracteis* lanceolatis 2 mm. longis; *calyce* cupuliformi, 3 mm. longo glabro, dentibus 5 obscuris; *corolla* glabra 5 mm. longa, lobis oblongis obtusis 5; *staminum* antheris oblongis 4 mm. longis, extra glandulosi, filamentis brevissimis; *stylo* aequilongo stigmatibus capitato. *Bacca* globosa 5 mm. crassa 4-ocularis, semine in loculo solitario; *calyce* patelliformi 7 mm. lato.

SARAWAK : Rejang Kapit, March 1893, *Haviland* 3043.

The flowers are all in bud; probably the filaments lengthen as does the style when in flower. A very distinct plant with large hairy leaves, the stem bearded. The hairs are not simple, but possess numerous lateral branches, making them plumose.

***Premna pallescens* Ridley** (Verbenaceae); *P. perakensem* King simulat sed foliis subtus albescentibus, calyce subintegro, corolla brevi, staminibus brevibus, differt.

*Frutex?* *Rami* albescentes. *Folia* coriacea glabra superne laevia brunnescentia (in sicco), subtus alba, oblongo-oblanceolata cuspidata basi obtusa, nervis 5-paribus superne cum costa depressis subtus elevatis, reticulationibus subtus elevatis conspicuis, 12-13 cm. longa 4 cm. lata. *Corymbus* terminalis, pedunculo 1-1.5 cm. longo, ramis paucis 2 cm. longis puberulis, *bracteis* oblongis obtusis 2 mm. longis infra ramos, *bracteolis* ovatis minutis; *floribus* brevissime pedicellatis; *calyce* cupulato ferme integro puberulo, lobis 4 rotundatis; *corolla* cylindrica ferme 2 mm. longa, lobis 4 ovatis brevibus; *staminibus* breviter exsertis, antheris reniformi-globosis; *ovario* 4-oculari, *stylo* brevi, *ovulis* in quoque loculo solitariis.

BORNEO : Kuching, Sarawak, *Haviland* 3052.

In foliage this resembles *P. perakensis* King but the calyx is nearly entire and the stamens much shorter. The white underside of the stiff leaves is very characteristic.

***Vitex flava* Ridley** (Verbenaceae); affinis *V. longisepalae* King sed subglabra, paniculis minoribus laxis patentibus paucifloris glabris, bracteis minoribus, sepalis minoribus.

*Arbor parva*. *Folia* trifoliolata herbacea petiolis 7-8 cm. longis pubescentibus dein glabris, foliolis ovatis acuminatis basi cuneatis nervis 8-paribus, 10-15 cm. longis 4-10 cm. latis, superne glabris glandulosi costa nervisque brunneo-pubescentibus exceptis, subtus glanduloso-punctatis nervis decidue pubescentibus; petiolulis lateralibus 5 mm. longis terminali 3 cm. longo. *Paniculae* axillares pedunculis 2 cm. longis ramis patentibus aequilongis decidue puberulis, *bracteis* oblongis spathulatis obtusis 5 mm. longis; *alabastris* dense velutino-pubescentibus. *Flores* flavi pedunculis 2 mm. longis; *calyce* campanulato tubo 2 mm. longo lobis oblongis obtusis



3 mm. longis glanduloso-punctatis; *corolla* glandulis flavis tecta. *Drupa* globosa polita 5 mm. diametro, calyce accrescente.

BORNEO : Sarawak, path to Tegora, Dec. 20, 1892, *Haviland* 2025. "Small tree, corolla yellow."

This is most nearly allied to *V. longisepala* King, of the Malay Peninsula, but that is densely hairy all over, whereas this plant is almost completely glabrous with merely a little deciduous pubescence, the bracts are much smaller and the sepals and corolla are covered with yellow glands as is the ovary and the leaves on both sides.

**Vitex Havilandii** Ridley (Verbenaceae); affinis *V. tetragonae* H. Hallier, ramis haud tetragonis, foliis minoribus coriaceis basibus obtusis, corolla multo minore differt.

*Arbor* parva. *Ramuli* puberuli. *Folia* coriacea unifoliolata, foliolo lanceolato cuspidato (cuspidē 1-1.5 cm. longa) basi obtuso 8-11 cm. longo 3-5 cm. lato, nervis 9-paribus inarcuantibus 2 mm. a margine, subtus elevatis, reticulationibus conspicuis, costa in utroque latere elevata, petiolis 1.5-2 cm. longis apicibus incrassatis. *Paniculae* laxae pauciflorae in axillis superioribus 5-8 cm. longae puberulae ramis 1-3 cm. longis. *Flores* parvi 2-3 in ramulis brevibus, pedicellis 1 mm. longis, *bracteis* linearibus acuminatis 1 mm. longis; *calyce* cupuliformi 2 mm. longo dentibus 5 acutis usque subacutis brevissimis; *corolla* 6 mm. longa, basi glabra superne pubescente, lobis 4 oblongis obtusis, labello rotundato integro; *ovario* in calyce immerso globoso.

SARAWAK : Sadong, Coalmine Hill, *Haviland* 861.

Species allied to *V. tetragona* H. Hallier which I know only from the description, but the leaves are smaller, not acute at the base nor chartaceous; the calyx is not pubescent and the corolla much smaller.

**Saurauia Fraseri** Ridley (Actinidiaceae); affinis *S. Ridleyi* Merrill, foliis etiam junioribus glabris floribus glabris sepalis petalisque ovatis latioribus.

*Arbor?* *Rami* nigro-brunnei, trichomatibus lanceolatis acuminatis parvis. *Folia* glabra oblanceolata acuta, basi attenuata marginibus remote denticulatis, nervis 14-paribus arcuantibus subtus elevatis, nervulis transverse parallelis, costa subtus elevata trichomatibus perpaucis, 28 cm. longa 10 cm. lata, petiolis 1.5-3 cm. longis, trichomatibus in junioribus multis, deciduis. *Racemi* trichomatibus tecti axillare, 2 cm. longi. *Flores* parvi glabri, sepalis 4 mm. longis ovatis obtusis, petalis oblongis obtusis 1 cm. longis, stylis 3, filiformibus, ovario hirtis.

BRITISH N. BORNEO : Banggi, 500 ft., March 1885, *M. Fraser* 233.

This is undoubtedly allied to *S. Ridleyi* Merrill, but the whole plant is much more glabrous, having only stiff flat hornshaped trichomes on stem and racemes, and very few on the midrib of the leaves.

## XLVI.—NOTES ON AFRICAN GRASSES: X.\*

O. STAPF & C. E. HUBBARD.

### A NEW GENUS FROM TANGANYIKA TERRITORY.

**Heterocarpha** *Stapf et Hubbard*, gen. nov.; affinis *Eragrosti* P. Beauv., sed differt spiculis secundum rhachin racemorum secundorum spiciformium dispositis, glumis heteromorphis, gluma inferiore spicularum terminalium coriacea 5-6-nervia, lateralium membranacea 1-3-nervia uno latere auriculata auriculo rotundato, gluma superiore spicularum omnium coriacea 6-8-nervia, lemma-tibus breviter mucronatis ad nervos infra medium pilosis.

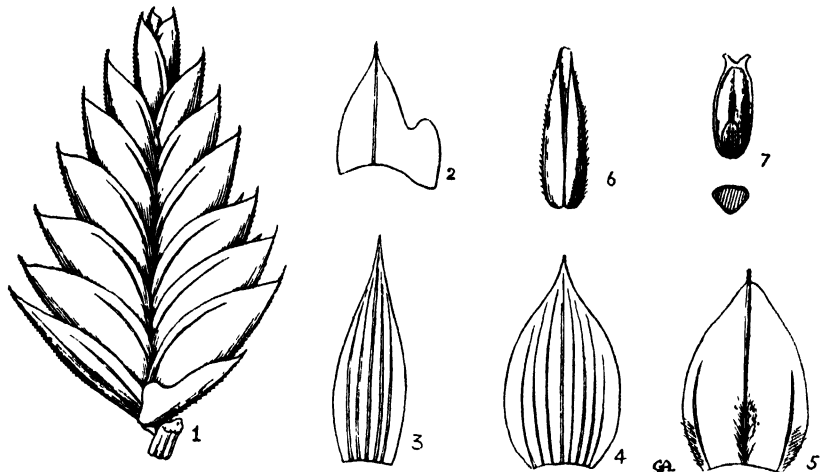
*Spiculae* ambitu oblongae, lanceolato-oblongae vel ovato-oblongae, lateraliter valde compressae, alternatim biseriatae atque dense imbricatae, secundae, subsessiles in rhachi triquetra racemorum spiciformium; rhachilla supra glumas articulata (?) et inter anthoecia continuata, glabra. *Anthoecia* saepe numerosa, dense imbricata, ♀ vel summa plus minusve redacta. *Glumae* spicularum terminalium subaequales et similes, caeterarum inaequales et dissimiles; gluma inferior spiculae terminalis a latere visa oblique lanceolata tenuiter acuta, explanata ovata acuta vel raro subbifida, coriacea, arcte prominenter 5-6-nervia, spicularum lateralium ovata, acuta, mucronata, 1-3-nervia, membranacea, uno latere auriculata, auriculo rotundato rhachin versus spectante; gluma superior spicularum omnium a latere visa oblique lanceolata acuminata, explanata late elliptica, acute acuminata, mucronata, coriacea, marginibus membranaceis, arcte prominenter 6-8-nervia. *Lemmata* acute carinata, a latere visa oblique ovata acuta, explanata late ovata, subobtusata vel obtusa, breviter mucronata, firme chartacea, trinervia, nervis infra medium breviter pilosis exceptis glabra, nervis lateralibus supra medium evanescentibus. *Paleae* lemma-tibus paulo breviores, infra medium leviter gibbosae, dorso lanceolatae, bicarinatae, inter carinas ciliolatas profunde concavae. *Lodiculae* duae, cuneatae, minutae, carnosae. *Stamina* 3; antherae lineares. *Ovarium* glabrum; styli distincti; stigmata plumosa, lateraliter exserta. *Caryopsis* oblonga, triquetra, lem-mate paleaque laxa inclusa; pericarpium tenuissime membranaceum, plus minusve laxum.—Gramen perenne glaucum; ligulae truncatae, breves, membranaceae; foliorum laminae lineares vel inferiorum lanceolatae, rigidae; panicula e racemis brevibus pedunculatis approximatis composita; racemi primo oblique erecti, demum horizontaliter patentes et disarticulati (?); spiculae arcte congestae, purpureo-variegatae.

Species 1, in Tanganyika Territory.

**Heterocarpha** *Haarereri* *Stapf et Hubbard*. *Culmi* in rhizomate brevissimo fasciculati, basi firmi atque rigidi, saepe vaginis foliorum annotinorum laxa circumdati, ex nodo secundo saepe ramosi et abhinc per spatium breve arcte foliosi, in caespites laxos intertexti,

\*Continued from *K.B.* 1929, p. 87.

tunc erecti vel adscendentes, 9–22 cm. alti, vel interdum elongati, ad 55 cm. alti foliis dissitis, graciles, teretes, glabri laevesque, internodio summo (pedunculo) ad 20 cm. longo. *Foliorum vaginae* tenuiter striatae, firmae, glabrae laevesque vel raro sparse hirsutae, inferiores (annotinae) latae, laxae, pallidae, superiores laxae vel arctae, glaucae; ligulae ad 2 mm. longae, minute laceratae; laminae basi abrupte contractae vel sensim in vaginam abeuntes, apice attenuatae, duriusculae, tenuiter acutae vel subacutae, 0.5–10 cm. longae, ad 5 mm. latae, planae vel marginibus involutae,



*Heterocarpha Haareri* Stapf et Hubbard. 1, Spikelet ( $\times 8$ ). 2, Lower glume of a lateral spikelet ( $\times 6$ ). 3, Lower glume of a terminal spikelet, ( $\times 6$ ). 4, Upper glume ( $\times 6$ ). 5, Lemma ( $\times 6$ ). 6, Palea ( $\times 6$ ). 7, Caryopsis and section of same ( $\times 12$ ).

erectae vel patentes, firmae rigidaeque, glaucae, glabrae vel supra obscure et sparse hirsutae, marginibus et apicem versus minute scaberulae. *Inflorescentia* 1.5–9 cm. longa, secunda; axis primarius tenuiter striatus, glaber laevisque, internodiis 0.4–1.7 cm. longis. *Racemi* 3–10, 0.8–2.8 cm. longi, conspicue secundi, inferior nonnunquam bractea squamiformi subulato-lanceolata ad 2 mm. longa suffultus; pedunculi secundarii 1.5–3 mm. longi; rhachis ad 0.6–1 mm. lata, continua, dorso tenuiter striata; pedicelli brevissimi. *Spiculae* 5–14 mm. longae, 3.5–6.5 mm. latae. *Glumae* ad carinas scaberulae; inferior spiculæ terminalis 4–6.5 mm. longa, spicularum lateralium 2–3.5 mm. longa; superior 4–6.5 mm. longa. *Anthoecia* 6–16. *Lemmata* 3–4.5 mm. longa, ad carinas scaberula. *Antherae* 2–2.5 mm. longae. *Caryopsis* 1 mm. longa.

TANGANYIKA TERRITORY: Pare District; Kihurio, c. 720 m., Aug. 1928, *Haarer* 1470! (type). Nkomazi, c. 780 m., *Haarer*, 1714!

The strongly compressed many-flowered spikelets bear a distinct resemblance to those of some species of *Eragrostis*, such as *E. superba* Peyr., in which the spikelets fall entire. The manner in which the

spikelets of our genus break up is rather obscure, but it seems certain that they do not disarticulate between the florets.

Of the other genera, which group round *Eragrostis*, *Sclerodactylon* and *Halopyrum* may be mentioned in this place, *Sclerodactylon* differing in its very tough junciform leaf-blades, paired or ternate spikes, one-nerved glumes, glabrous lemmas and paleas with winged keels, whilst *Halopyrum* is distinguished by its less compressed spikelets which readily break up at maturity, by the silky-hairy basal callus of the florets and by the elongated panicle.

*Heterocarpha Haareri* is named after its collector, Mr. A. Haarer, District Agricultural Officer, who during recent years has done much to increase our knowledge of the flora of the north-eastern section of Tanganyika Territory. The collection in which our new genus was received was composed of plants mostly collected in the Pare District. It included many species, whose area is now considerably extended or is much less discontinuous than formerly appeared to be the case. Among the grasses received were such interesting species as the following :—*Leptochloa Appletonii*, *Eragrostis bifaria*, *Tetrapogon tenellus*, *Schoenefeldia gracilis*, *Oropetium Thomaeum*, *Latipes senegalensis*, *Lintonia nultans*, *Brachiaria serrifolia*, *B. lachnantha*, *Digitaria macroblephara*, *D. Rivae*, *D. pennata*, *Dichanthium papillosum* and *Chrysopogon Aucheri* var. *quinqueplumis*.

## XLVII.—MISCELLANEOUS NOTES.

MR. C. H. WRIGHT, A.L.S., has retired from the post of Assistant at the Royal Botanic Gardens, Kew, after 45 years' service in the Herbarium. He was appointed an Assistant on September 1st, 1884, and retired on reaching the age limit on August 31st, 1929. Before coming to Kew he was an Assistant in the Herbarium and Library at the Botanic Gardens, Oxford.

Among his many activities during the long period of his service at Kew, one of the most important was in connection with the building of the new wing of the Herbarium. Mr. Wright was assigned the task of re-arranging the collections and organising the whole of the moving over of the specimens and arranging them in the new wing—a task for which, by reason of his well-known accuracy and mastery of method, he was particularly fitted. For many years, all the detail work in connection with the receipt and despatch of specimens had been in his hands, and his knowledge of the history of the Herbarium collections has enabled him to render very valuable services to Kew. Another important piece of work which he has carried out has been the reading of the proofs of the African Floras—a task needing meticulous accuracy and attention to detail.

In addition to these many duties he has been able to carry out a considerable amount of systematic research work, about which it is unnecessary to particularise in this note.

His loss at Kew will be felt very greatly, since for many years past he has been in charge of the Palms and Petaloid Monocotyledons and the Ferns and Mosses. As specialists on the Cryptogams are now few in number it will not be easy to find anyone to take Mr. Wright's place in this particular and very important field. In the year 1896 he was awarded the distinction of the Associateship of the Linnean Society. He leaves Kew with the best wishes of all his colleagues that he may fully enjoy the leisure of his retirement.

RETIREMENT OF DR. N. L. BRITTON.—Dr. N. L. Britton, who has occupied the position of Director-in-Chief of the New York Botanical Garden since 1896, retired from that important post on July 31st, 1929.

The Gardens were established by an Act of the Legislature of the State of New York in 1891, and their development is due to the energy and organizing power of Dr. Britton.

Dr. Britton first visited Kew in 1888, and has been a welcome visitor on many occasions since, especially when accompanied by Mrs. Britton, who is a keen bryologist. The relations between Dr. Britton and Kew have always been of the most cordial nature, and he has generously contributed many specimens to the herbarium, including those from his twenty trips to the West Indies. He has also given us valuable help in the determination of American plants.

We offer him our sincere good wishes for many years of health and happiness, combined with continued botanical activity, in his retirement.

The post of Director-in-Chief of the New York Garden has been offered to and accepted by DEAN ELMER D. MERRILL, Dean of the College of Agriculture, University of California, and he will take up his new duties on January 1st, 1930.

Dr. Merrill has for many years been a valued correspondent of Kew, both during his time in the Philippine Islands and since his return to Berkeley.

We beg to offer him our sincere congratulations on his new appointment, and look forward with confidence to the continuance of the very valuable and pleasant relations which have existed for so long a time between the New York Botanical Garden and Kew.

**The Edible Canna** (*Canna edulis* Ker-Gawl.).—This South American plant, which has been known to cultivation in tropical countries for many years under such names as "Edible Canna," "Queensland Arrowroot," "Tous les Mois," etc., has been attracting special attention in certain countries in recent years. Since its introduction to Southern Rhodesia by the Agricultural Department in 1922 it has shown great promise as a stock-food, particularly where pig-raising, dairying, or the fattening of steers is practised. Being fairly drought-resistant and not exacting as to climatic conditions it is proving particularly suitable for Rhodesian conditions, and both the starchy root-stocks and the tops can be fed to stock.

During the last ten or fifteen years a great deal of interest has been taken in the plant in Hawaii as a commercial source of starch. In the Waimea district of Hawaii the repeated failures of most of the staple crops of cultivators were instrumental in a search being made for a crop that could be depended upon as a source of food-stuff. The Edible Canna was found to grow well at the higher altitudes of that district. The ill-effects of strong winds—the only serious drawback—were overcome by growing suitable wind-breaks. Thousands of acres of the uplands, not suited to pineapple and sugarcane growing, have been found to be suitable for the crop.

As is the case with other root crops the Edible Canna grows most successfully when planted in soil of a loose porous nature containing an abundance of humus. When cultivated in clay soils the tubers are smaller and the yield is considerably reduced, in addition to which the work of harvesting is rendered more difficult. The plant can withstand an excessive amount of moisture in the form of rainfall or irrigation, provided the area is well drained. In planting, tubers are generally placed at a depth of three to five inches in the soil at distances of three feet in rows three feet apart : this allows of cross cultivation when the plants are young. Periodical cultivation can be carried on for four or five months from planting, after which injury to the spreading growth of the clumps of stalks is likely to occur. However by this time weed growth is generally effectively kept down and smothered by the dense shade of the foliage.

Unless checked by frosts or by lack of moisture the plants will continue to grow indefinitely, and the time of harvesting therefore depends upon the length of the growing season. If the crop is grown as a stock-feed the tubers can be left in the ground and used as required. In starch production the tubers should be milled soon after being removed from the ground, as exposure is likely to have a deteriorating effect on the quality of the starch. Harvesting does not present any difficulty as the tubers are formed in a mass near the surface of the soil and are easily lifted.

Yields are influenced in the main by the fertility of the soil and the period the crop occupies the ground. In Hawaii, where the growing season is more or less continuous, results have been obtained\* varying from ten tons of tubers per acre within four months after planting, to thirty-four tons within twelve months after planting, with an average yield ranging from eighteen to twenty tons per acre for eight-month periods. At the Salisbury Experiment Station in Southern Rhodesia, where the growing season is limited, the yields obtained under practical farming conditions were regarded as very favourable, and were in the neighbourhood of six to seven tons per acre (tubers only), seasonal rainfall for the year being only

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\*"Edible Canna in Hawaii," by H. L. Chung and J. C. Ripperton. Hawaii Agric. Exp. Stn. Bull. No. 54 (1924), 16 pp. (Government Printing Office, Washington).

22.39 inches.\* It is reported that in Hawaii from forty to fifty pounds of tubers have been obtained from single 'hills.'

What is regarded as an important feature about the crop is the good keeping qualities of the tubers. These can be stored for several months, provided that any soil adhering to them is removed and that they are dry when put into storage. In this respect it is superior to the Sweet Potato (*Ipomoea Batatas* Poir.), an important stock-feed in Rhodesia at the present time. A point of inferiority compared with the Sweet Potato, however, is that it cannot be propagated from stem cuttings, and quite an appreciable proportion of the crop each year has to be retained for propagating suckers for the following season.

The Edible Canna has been grown in Queensland to a varying extent for upwards of fifty years as a source of starch and for the manufacture of Queensland arrowroot. A peculiarity about the starch is the exceptionally large size of the grains or granules. These are larger than, though morphologically similar to those of the potato, and very much larger than those of Maize and Cassava. The starch has a glossy appearance, with a decided glisten in certain lights, in marked contrast to the smaller-grained starches which are of a dull amorphous appearance. When cooked it forms a semi-translucent rather sticky mass and is recommended for the use of infants and invalids, due to its large granules.

The small immature tubers are said to resemble white potatoes in taste and consistency when cooked, but soon become too fibrous to be palatable. In the mature state they are little used for human consumption and require to be cooked for a long time. F. N. H.

**The Chinese Gooseberry.**—This comparatively little-known fruit (*Actinidia chinensis* Planch.) appears to be receiving increased attention in New Zealand, its success being most marked in the northern part of the Dominion.† The oval fruits, about two inches in length, are of a soft pulpy nature when ripe, with minute seeds, and are covered with hair. This hair can be easily rubbed off the fruits before they are fully ripe, at which stage the fruits should be picked. Well ripened fruits are claimed to be luscious with a sweet pleasant flavour, and to be suitable alike for dessert purposes, fruit salads, jam-making, etc. The vine has been found to be of rapid growth in New Zealand and is not exacting as to soil conditions. It was introduced to cultivation in England in 1900 and flowered here for the first time in June 1909. As the plant is for the most part unisexual care has to be taken to have both male and female plants present if fruit is to be expected. Hermaphrodite plants are sometimes met with. F. N. H.

\*"The Edible Canna," by D. E. McLoughlin Rhodesian Agric. Jour. Vol. xxv, No. 6 (June, 1928), pp. 664-674 (Rhodesian P. & P. Co., Ltd., Salisbury, Rhodesia).

†Journal of the New Zealand Institute of Horticulture, Vol. i, No. i, June, 1929, pp. 2-4. "Chinese Gooseberry" (*Actinidia chinensis*) by W. H. Rice.

**Cyprian Colocynth.**—Colocynth, the pulp of the fruits of *Citrullus Colocynthis* Schrad. has long been used in medicine on account of its powerful cathartic properties. The plant has a very wide range extending from south-eastern Europe to China, though Egypt is probably the chief source of the trade product. An account of the examination and commercial valuations of a recent consignment from Cyprus is given in the Cyprus Agricultural Journal for July, 1929, pp. 797-8. The sample consisted of broken pieces of pulp up to 3 in. in length, almost devoid of seeds and varying in colour from white to greenish yellow. It complied well with the requirements of the British Pharmacopoeia, and, except for the unusual colour and being slightly fibrous, was regarded as comparing favourably with the Egyptian grade.

F. N. H.

**A First Biology.\***—This small introductory text-book of 184 pages is intended to "open the eyes of the pupils to the fundamentals of biology." The subject-matter is arranged under eleven chapter headings "to display the unity of life, and to develop the idea of evolution." It is an excellent sign that the authors have realized the limitations of the type system—so often mis-used in English schools and colleges—and have considered a broader treatment essential. It is again all to the good that such subjects as heredity and evolution are not considered too 'advanced' for introductory treatment in a book of this standard. Animals and plants are dealt with as parallel groups—a method which must necessarily lead to such essentially biological viewpoints as ecology, genetics, and evolution.

The eighty-nine text-figures are mostly diagrammatic, with little or no shading, and are suitable for blackboard reproduction. With its broad treatment and, with few exceptions, accurate and up-to-date details this book can be thoroughly recommended to teachers in all parts of the British Empire. A second, more advanced, part is promised for the immediate future.

W. B. T.

**Botanical Magazine.**—The first part of Volume cliii (1927) of the Botanical Magazine has now been published and contains eleven plant portraits. Two of them are of striking hybrids of considerable horticultural value, one being  $\times$  *Crinodonna Corsii* (t. 9162), a hybrid raised by fertilizing flowers of *Amaryllis Belladonna* with the pollen of *Crinum Moorei*; the other  $\times$  *Salvia superba* (t. 9169). The latter is a well-known garden plant, cultivated generally under the name *Salvia nemorosa*, and has been a conspicuous feature at Kew for many years. The assumed parents of this sterile hybrid are *S. silvestris* Linn. and *S. villicaulis* Borbás. The other plants figured are:—*Picea omorika* Bolle (t. 9163), a valuable spruce for the neighbourhood of London, which does not suffer from chermes.

\*By S. Mangham and W. Rae Sherriffs. Sidgwick & Jackson Ltd., 44, Museum Street, London, W.C. 1, 1928. pp. viii + 184, text figs. 89, price 2s. 6d.



Figure 4 on the plate, it should be noted, represents an anther which by a printer's error reads "another." *Eustephia Pamiana* Stapf (t. 9164) is a new species of this genus of the *Amaryllidaceae*, native of Tucuman in the Argentine, named in honour of Major Pam who flowered bulbs received from Tucuman in 1926. *Rhododendron haematodes* Franchet forms the subject of plate 9165; it was introduced to cultivation in this country by Mr. Forrest from the mountains above Tali, West Yunnan. *Primula vulgaris heterochroma* W. W. Smith & Forrest (t. 9166), is an interesting Primrose from the southern coast of the Caspian, resembling in habit our British plant, and promises to be an interesting garden plant. *Carduncellus multifidus* Coss. & Dur. (t. 9167), is an interesting thistle-like plant from N. Africa introduced by Mr. E. A. Bowles. The next plate (t. 9168), represents *Corokia macrocarpa* T. Kirk, a native of Chatham Island. The Costa Rican orchid *Epidendrum pumilum* Rolfe forms the subject of plate 9170; it belongs to the group having the column continued into three lobes which surround the broad clinandrium like a cuff. *Cotoneaster glaucophylla* Franch. f. *serotina* is represented in plate 9171, and is found in Western Yunnan. The doubts which have existed as to the two species *C. serotina* Hutchinson in Bot. Mag. t. 8854 and *C. glaucophylla* Franch. are settled in the text relating to this plate. *Acacia extensa* Lindl. (t. 9172) is the final picture in this part and comes from the mountains of the N.W. corner of Western Australia. The plant has been grown for many years in the Temperate House at Kew whence the flowering material for the Plate was provided.

**Forest Trees.\***—In the Translator's Preface it is stated that "there is, so far, no book dealing comprehensively with the structure and life of forest trees . . . no work collects together in one volume the results of past researches in this field with reference to the original papers." It is to fill this gap that Büsgen's book has been translated into English.

The work, in general terms, is in the nature of an advanced book dealing with botany as the basis of the study of the living tree, but treating of the aspects most relevant to the life of the tree in a detailed manner. The structure and function of the individual is explained, and its origin and development under internal and external influences. The examples generally given are trees of the North Temperate Region.

Some chapters carry the subject from botany into the more technical sphere, where, as in Chapter VII, the anatomical basis of the technical properties of timbers follows the botanical treatment of the general structure and growth of the stem.

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\*"The Structure and Life of Forest Trees," by Büsgen, Third edition by Münch translated into English by T. Thomson. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C. 2, 1929, pp. xi + 436; figs. and plates 173. Price 30s.

Many problems connected with the growth of trees are discussed and others, of which no explanation is as yet forthcoming, are indicated.

The value of a book of this nature outside the libraries of the limited number of Schools of Forestry is somewhat doubtful. The treatment of the botanical portion is too advanced to permit a forester to forego instruction in botany ; on the other hand, a student, with an efficient training in botany, should not require the repetition here of matter which he has found in botanical text-books. The system of presenting each subject in the form of a résumé of research work, whilst enhancing the value of the book as a work of reference, limits its general usefulness, owing to its size and the extended treatment of each subject.

The photographs, unfortunately, have not been well reproduced, and in most cases permit only an outline of the subject depicted to be seen whilst the detail of the picture is lost.

The Key to trees by their buds (p. 79) and the Key to the anatomical structure of timbers (p. 131) are helpful and more aids in this direction would have been useful.

There is a wealth of information about every part and function of the common trees of the Northern Hemisphere, and the comprehensive indices facilitate easy reference. The translation has been carried out freely so that the reading is easy and is not hampered by technical expressions and names in the original language.

The Translator must be congratulated on his energy and perseverance in achieving the publication in English of such an intensive study which includes a mine of detailed information.

**A Local Flora for Madras City.\***—The object of this work is to assist the amateur and the student of botany to identify the plants found in and around the City of Madras in South India. The arrangement is that of the *Genera Plantarum* but the taxonomy is more up to date. An original key to the families and aberrant genera is provided and seems efficient ; together with the generic and specific keys to be found under the families and genera containing more than one genus or species respectively, they should make determination an easy matter for anyone. Technical terms have been avoided as far as possible, but considerations of space render a moderate use unavoidable and so a glossary of the terms employed is added. Brief but sufficient descriptions of families, genera and species are included so that the determinations arrived at by the keys can be checked. Elaborate synonymy would be out of place in a work of this nature and has been wisely omitted ; the few

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\*“The Flowering Plants of Madras City and its immediate neighbourhood,” by P. V. Mayuranathan, B.A., Botanical Assistant, Madras Government Museum.—Bulletin of the Madras Government Museum, New Series, Natural History Section. Vol. III. 4to, pp. 1-335, pl. 1-38. Government Press, Madras. Price (paper covers) Rs. 8.

alternative botanical names given are those used in the Flora of British India when they differ from those now accepted. The English, Tamil and Telugu names when known are given, as well as the months of flowering, the situations in which the species is found, and a brief note of uses. General distribution beyond the area is not quoted but the native country of exotics is stated. All wild flowering plants (except grasses) known to occur in the area covered are included as well as aliens that have more or less established themselves and many of the exotics commonly grown in gardens and avenues. The total number of species is 828, of which 197 are illustrated by good line drawings in 38 plates at the end of the volume, which should further facilitate correct naming. To arrive at these figures the separate citations had to be counted ; it would be an improvement if they were serially numbered. The volume is rather ponderous and might well have been reduced in size by the use of smaller type and thinner paper. On the other hand the figures might usefully be larger ; this could have been effected without increased space by placing fewer on a page and printing the names on the same side instead of marooning them in 4 to 8 lines in the middle of a sheet the reverse of which is left blank. There are a few typographical errors but these minor defects do not really detract from a praiseworthy piece of work, excellently turned out, which meets a definite want and on which the author, the Government Museum, and the Press are to be congratulated. C. E. C. F.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1929 ROYAL BOTANIC GARDENS, KEW

## XLVIII.—A BOTANICAL TOUR IN SOUTH AFRICA. J. HUTCHINSON.

The opportunity for sending a Botanist from Kew to South Africa has long been desired, both by the South African Botanists as well as by ourselves. Fortunately, the grant from the Empire Marketing Board to Kew for the purpose of sending out collectors as in old days, has made such visits possible, and I was able to depute Mr. J. Hutchinson, Assistant in the Herbarium, to undertake this mission during the autumn, winter and spring of 1928-9.

Mr. Hutchinson has prepared the following brief sketch of his tour, rendered all the more valuable by the very kind help he everywhere received in South Africa. The results he has obtained both in living and Herbarium material, and the friendly relations existing between Kew and botanists and others in South Africa which have been greatly strengthened as a result of his visits, have, I consider, fully justified the foresight of the Empire Marketing Board in making this grant to Kew, to enable us to become better acquainted with the vegetation of the Empire and its economic possibilities. A. W. H.

I left Southampton by the Union Castle Royal Mail Steamer *Saxon* on July 27th, 1928, and after a pleasant voyage arrived at Capetown early in the morning of August 13th. Whilst at Madeira I took the opportunity of visiting the interesting garden of Dr. Michael Grabham, an old and valued correspondent of Kew, now a hale and hearty veteran of 90 years of age. Amongst many interesting plants which took my eye was a fine specimen of *Magnolia grandiflora* about 60 ft. high and with a trunk quite 6 ft. in circumference; whilst its near relative *Liriodendron Tulipifera* towered 80 ft. high and had a girth of 12 ft.

At Cape Town it was a pleasant surprise to find several botanists on the quay to give me a welcome, and this proved to be but a foretaste of the constant help and kind hospitality which I received during the whole of my stay in South Africa. Mrs. F. Bolus and Mr. N. S. Pillans of the Bolus Herbarium, Professor R. H. Compton, Director of the National Botanic Gardens, Kirstenbosch, together with Dr. R. Marloth and Mr. Griffiths representing the Botanical Survey, were there to give me their valuable help and advice at the outset, and plans were soon forthcoming for several interesting collecting excursions in South-Western Cape Colony. Within half-an-hour of landing I was transported by Mrs. Bolus and Mr.

Pillans and introduced to the botanical treasures of the Cape Flats near Table Bay and, like Burchell, "As soon as we had passed the houses . . . my attention . . . was entirely engrossed by the rich and wonderful variety of plants that grew in every spot . . . and I recognised some well-known flower which I had seen nursed with great care in the green-houses of England." On account of rather wet and unsettled weather the first few days were mainly occupied in inspecting the National Botanic Gardens at Kirstenbosch and the Bolus Herbarium. For this purpose Professor Compton and Mrs. Bolus were very helpful and gave me every facility for study. I was very pleased to find still preserved in and around Kirstenbosch a considerable quantity of the Silver tree, *Leucadendron argenteum* R. Br. The National Botanic Gardens at Kirstenbosch have perhaps the finest site for the purpose in the world. Frost is unknown, the annual rainfall is sometimes more than generous, and the natural scenic beauty of the gardens and the surrounding districts is wonderful. It is therefore an ideal situation for the cultivation of much of the extraordinary flora of the South Western districts. Such a salubrious climate is, however, not always suitable for representatives of other floral regions in South Africa. In fact to be in any way adequately represented, South Africa needs as many as five separate botanic gardens, one for the South-Western region represented by Kirstenbosch, and one each for the wonderful Karoo flora, for the flora of Namaqualand, for Natal and for the Transvaal. It is pleasing to know that something is being done in this direction, for owing to the generosity of the late Mr. James D. Logan of Matjesfontein, a Karoo garden has been established by Professor Compton at Whitehill near Matjesfontein, where the rarities and interesting plants of the Karoo are being grown.

Owing to the kindness of Mrs. Bolus, to whom I am also indebted for much hospitality, I had as companion and guide in exploring the Cape Peninsula and other parts, Mr. N. S. Pillans, Assistant in the Bolus Herbarium, who spent upwards of a month with me and was of very great assistance then and throughout my stay in the Union. With him I explored a considerable portion of the Cape Peninsula and the country as far as Saldanha Bay, and he accompanied me on a trip to Namaqualand with Mr. J. Logan, which I shall mention later. I also had the pleasure of accompanying him to the flower shows at Caledon, Tulbagh and Ceres, at which he acted as judge. At these centres we usually spent two or three days collecting.

For travelling purposes\* Dr. I. B. Pole Evans, C.M.G., Chief of the Division of Plant Industry of the Department of Agriculture and Director of the Botanical Survey, had kindly arranged for me to have the use of a Government motor-car, and I availed myself of this for upwards of a month. As running costs proved somewhat high,

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\* I am also indebted to the South African Government for facilities for travelling by rail, of which, however, I had but little opportunity of making use.

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however, I acquired the use of a smaller and much more economical Citroën car equally suitable for my purposes, and with this little and somewhat ancient vehicle, I covered nearly 7,000 miles of roads during my stay. It served me faithfully and well, except on one occasion, of which I shall speak later. For botanical collecting in a hot climate like that of South Africa, a car is now an essential part of the outfit, since the distances to and from suitable collecting grounds are often very considerable, and dull and uninteresting stretches of country can be passed through rapidly. A week-end was spent at Worcester accompanied by Mr. Dunsdon, who was in charge of the South African floral display at the Wembley Exhibition, and there the Memorial Garden designed by Mr. Naude was inspected. It is beautifully laid out in the middle of the Commonage, and at the time of my visit was gay with the Gousbloom, *Venidium fastuosum* Jacq. (*V. Wylei* Harv.) from Namaqualand. Mr. Naude's sketches of Namaqualand were particularly interesting and revealed to me the amazing beauty of that country in a favourable season. He most kindly took us to collect in the Hex River Mountains and around Brandvlei. A spell of bad weather followed this excursion and necessitated spending some time at the Bolus Herbarium. At this particular spot at Kirstenbosch during the wet winter months the atmosphere is frequently very moist, and the valuable collections of dried specimens and books are apt to suffer from damp. So far funds have not been available to allow for the installation of a permanent heating arrangement, but this should not be long delayed if the specimens are to be adequately preserved. Up to the present, Mrs. Bolus and the staff, who are well aware of the danger, do the best they can with small portable heating lamps, a very risky method in so valuable a place.

On Thursday, August 30th, I accompanied Professor and Mrs. Compton and Mr. N. S. Pillans on an excursion by car to Matjesfontein, to see a portion of the Karoo and visit the Karoo Garden at Whitehill. We went through various places hitherto familiar to me only on the map, including the renowned collecting ground, Sir Lowry's Pass. I was much struck with the complete dominance of the family *Proteaceae* in this area, and especially with the large expanses of various species of *Leucadendron* from there almost up to the Karoo. At that time of the year the mountains and valleys were beautiful with many tints of green and yellowish-greens, due mainly to *Leucadendron*. On my return in the autumn, alas, I was grieved to see much of these wide stretches completely blackened by fires.

A few days were spent in collecting along the foot of the Wittebergen and the Karoo around Matjesfontein, and in this we were joined and greatly assisted by Mr. J. Logan of Matjesfontein, a keen student of botany. The difficulty of travelling by car in some parts of the Karoo was thus early demonstrated to me on these excursions, for the roads, apart from the main trunk roads, are often mere tracks and even the experienced travellers I was with were sometimes

at a loss as to which way to turn. We returned via Karoo Poort, one of Burchell's collecting grounds, of which he gives an interesting description.\* In Mitchell's Pass I had the surprising experience of plodding through snowdrifts several feet deep, the result of a spell of exceptionally cold weather. The story of our crossing the swollen river at Ceres and the stranding of our car for some hours in the middle of the stream I must tell in another place; this and other experiences, however, stood me in good stead at a later date when travelling alone.

From September 4th to 6th an excursion was made by car with Mr. Pillans to Saldanha Bay, when we gathered a large number of herbarium specimens. But bad weather compelled us to return sooner than we had intended. Next a most enjoyable week-end was spent in company with Dr. R. Marloth as the guests of Mrs. Solly at Sir Lowry's Pass, where a wealth of *Proteaceae* and other plants were seen to great advantage. A considerable portion of Mrs. Solly's estate is in the nature of a botanical reserve. On leaving here I botanised alone in the Hottentots Holland mountains behind Gordons Bay. Returning to Cape Town via the Cape Flats I experienced the full force of a violent "sou' easter" and fully realised the great value of the Australian *Acacias* (*A. saligna* Wendl., etc.), in binding the sand in this wind-swept area. These plants have made life possible on these exposed flats, the *locus classicus* for many South African species of plants.

The next three weeks (September 14th to October 8th), were devoted to visiting the flower shows at Tulbagh, Ceres and Caledon with Mr. Pillans, collections being made in the neighbouring districts. Botanical excursions were also made to Paarl, and in addition I spent several days alone exploring the Cape Peninsula as far as Cape Point. On Monday, 8th October, Mr. Pillans and I left by train for Matjesfontein, whence we started by car on a "grand tour" of Namaqualand and Bushmanland with Mr. J. Logan as our very able guide. He generously used his large Studebaker saloon car for the purpose and devoted his whole energies to making the tour a success. Whilst a car may be regarded in many respects as a very great asset to a botanical collector, it depends largely on the willingness of the driver, even though he be a botanist, to stop on every occasion demanded by the untrammelled eyes of the passengers. When driving alone I frequently found at war within me the rival claims of the motorist and of the botanist, the one for speed and continued progress, the other for stopping to gather some interesting plant. The remark "We shall probably see it further on" is fatal, and I must record that Mr. Logan, however great the gradient or smooth the surface, always stayed our progress on request, and frequently through his own observant eyes spotted some rarity. Full particulars of this most interesting trip, when we found Hantams Berg near Calvinia too drought-stricken to warrant a visit, Bushmanland suffering from a four years' drought, and the return

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\* Burchell, Travels, 1 : 207.



journey close by the now famous Verneuk Pan and down the Zak River, will be published in due course. I shall not readily forget our traverse of the sand-dunes of Bushmanland, nor the long descent into Pella, at that time of year a veritable "inferno," near the banks of the Orange River. At Ookiep, Mr. Good was of great assistance, and a special excursion to Klipfontein, a small post on the Port Nolloth Railway, yielded a wealth of material. There I saw for the first time the great beauty of *Venidium fastuosum* Jacq. (V. Wylei Harv.) in its native habitat.

This most enjoyable trip was followed by a few days in drying the material collected and in despatching a quantity of living plants to Kew. After that a week-end was spent with Professor R. H. Compton and his family under canvas at the top of the Gydouw Pass, when we collected in the neighbouring mountains, many of which had unfortunately suffered from recent fires. On October 30th, I began a long trek, which was not to end until the middle of December, beginning at Cape Town and ending at Pretoria. For a part of this journey I was fortunate to secure the company of Mr. Jan Gillett, of Oxford, a keen young botanist, and Dr. Marloth kindly accompanied me as far as Warmbad beyond Barrydale. We naturally botanised all the way, visiting such interesting places as Ladismith, Seven Weeks Poort, Calitzdorp, Great Zwartberg Pass, Cango Caves, and Oudtshoorn. In the Montagu Pass on the way to George we fortunately met on the road Mr. Fourcade, who has made a special study of the flora of the country from Mossel Bay to Algoa Bay. He acted as our guide for several days, exploring the Knysna and Zitzikamma Forests, and we stayed with him at Witte Els Bosch, where we were able to compare notes in his excellent herbarium and library. We visited the Forestry Station at Deep Walls near Knysna, Mr. Laughton, in charge, very kindly assisting us in every way. It was interesting to see at last the celebrated giant specimen of *Podocarpus falcata* R. Br., about 127 ft. high and 21 ft. 4 in. in girth, six feet from the base.

At Port Elizabeth I was pleased to meet at the suburb of Hume-wood, Mr. H. C. Long, formerly a student gardener at Kew, who has transformed much of the locality from a wilderness of *Acacia* and sand into a beautiful place reminiscent of the Chines of Bournemouth and the Isle of Wight. I was glad to learn the town authorities were fully aware of Mr. Long's value to them, and he has since been given entire charge of the parks and open spaces on the retirement of Mr. Butters, whom I also met. At Port Elizabeth we were joined by Mr. R. A. Dyer, a member of the botanical survey stationed at the Albany Museum, Grahamstown. Dr. Pole Evans had arranged that wherever possible a member of his staff should accompany me on collecting excursions, an arrangement which proved to be a very happy one and of great help in every way. For a time Grahamstown was made our headquarters, and there much to my regret Mr. Gillett was due to leave me to join his parents in the Transvaal. He had

assisted me very much all the way from Cape Town and the journey thence might have been very different but for his congenial company. The Addo bush between Port Elizabeth and Grahamstown was of great interest. It is a distinct botanical formation, very different from the real Karoo with which it is usually classed. Mr. Dyer and I left Grahamstown, where I had been delayed for a few days by influenza, on November 26th, for our long road journey to Durban, whence he was to return by train. We collected on the Katberg and along the whole route via East London, Komgha, Libode, Port St. Johns, Flagstaff, Kokstad (where we unexpectedly met Dr. E. P. Phillips from Pretoria), Umzimkulu, Richmond and Pietermaritzburg. At the last place some time was spent with Dr. Bews and Dr. Sim, including visits to the College and the Botanical garden. There Mr. Kidd, a Kewite, worthily carries on the Kew traditions and made us very welcome. At Durban, which was reached on December 7th, I was much interested to see the Botanic Garden and herbarium of which the late Dr. Medley Wood was so proud. Under the care of the municipality the botanic garden is now in rather a poor state, which is much to be regretted. Scarcely any of the magnificent trees have labels and the place is generally untidy and neglected. The streets were at that time gay with the beautiful Flamboyant, *Delonix regia* Raf. (*Poinciana regia* Boj.).

Mr. Dyer having now returned to Grahamstown, I had to essay the somewhat rapid journey in three days to Pretoria alone, for I had received a message that General Smuts, whom I had seen in Cape Town, would be starting for a botanical tour of the Northern Transvaal on Dec. 14th, in which I had been invited to participate. I reached Pretoria at midday on Dec. 13th, by way of Pietermaritzburg, Howick, Estcourt, Colenso, Ladysmith, Glencoe, Newcastle, Volksrust, Standerton, Heidelberg and Johannesburg. On this journey I did not add much to my collections, but I experienced a vivid and somewhat terrifying thunderstorm which descended on me from the Drakensberg whilst still 30 miles from Newcastle and somewhat late in the day. Under such conditions the so-called "brown turf" roads were something of a nightmare from a motoring point of view. I remember "sitting tight" for quite an hour, not daring to move, whilst the lightning played around the little car and the road and the landscape gradually disappeared in the down-pour, no doubt a common enough experience to a South African, but rather disquieting for a visitor. The afternoon at Pretoria proved all too short to visit the herbarium and meet the Staff. Early next morning saw General Smuts helping to carry out my impedimenta from the hotel to three waiting cars completely supplied for a lengthy tour in the wilds of the Northern Transvaal, the General providing two of the cars, the third belonging to Mr. Arthur Gillett. Mrs. Gillett, an enthusiastic botanist who had already collected extensively in the Union, accompanied us with her two sons, Jan and Nicholas, and together with General Smut's son, Jannie Smuts, and a native

servant, we were a very enthusiastic and happy party, Mr. Gillett and his younger son making a study of the bird life.

This delightful trip will long remain a happy memory, but I cannot tell the full story here. It will be sufficient to indicate its main features. We travelled northward by the Cape to Cairo road via Nylstroom, Potgietersrust and Louis Trichardt as far as Messina, botanising by the way at the most likely places. Two lateral excursions were of very great interest, one from Louis Trichardt along the Zoutpansberg to Lake Fundusi, a little-known lake about 35 miles to the eastward, the other to the beautiful country at Woodbush, east of Pietersburg, to all of which General Smuts proved an enthusiastic guide and leader. From Messina, where we were sumptuously entertained by Mr. Emery, the manager of the mine there, we visited the botanical reserve at Dongola, recently acquired by the Botanical Survey. There were seen magnificent specimens of the Baobab, *Adansonia digitata* Linn., one particularly large example measuring 94 ft. around the trunk. It seemed to me as if the Baobab, in this its most southerly point of distribution, reaches also its maximum development. Its distribution southward, except for a few small isolated specimens, is effectually barred by the Zoutpansberg and its extension, the Blaauwberg. In the Zoutpansberg and along the Limpopo west of Messina, we met with many species of the tropical flora with which I am more familiar, including fine examples of my own *Bridelia mollis* and small forests of Prain's interesting *Androstachys Johnsonii*, both of these occurring in quantity on the Zoutpansberg near Wylie's Poort. The latter place provided a day or two of most interesting botanising. In the Zoutpansberg and in the Eastern Transvaal in the neighbourhood of Barberton, I was able to see at its best one of South Africa's most delightful leguminous shrubs, *Bauhinia Galpinii* N.E. Br., resembling in the distance masses of red Azalea, and a most desirable subject for the warm greenhouse in Europe. The Zoutpansberg range of mountains and the Blaauwberg are scarcely touched botanically and deserve a thorough investigation, for it is here that the great tropical flora to the north seems to end and the flora typical of South Africa begins. The vegetation is therefore of surpassing interest from a phyto-geographical point of view.

After Christmas I was invited to make my headquarters at General Smuts' farm at Irene, some miles to the South of Pretoria, and every facility was given me to dry my collections. From there I made several long excursions with various companions, besides botanising a good deal locally with General Smuts and the Gilletts. Part of the Magaliesberg was explored with Miss Verdoorn, of the National Herbarium (lately Assistant for South Africa at Kew) and Mr. van Baalen, also formerly at Kew and now head-gardener at the Union Buildings. On the 5th January I arrived by train at Louw's Creek, in the Eastern Transvaal, with Dr. Pole Evans and his assistants, together with Mr. van Baalen, and starting from there by

motor caravan we explored the region from Barberton to Komati Poort, including the Maid of the Mist mountain and the delightful country towards the Hora Mine. The advent of a violent storm compelled us to hasten from the latter place, for after such storms the roads are often impassable for some days. At Barberton I met the veteran botanical collector Mr. George Thorncroft, and Mr. Andrews kindly took us for a most interesting mountain drive towards the Lomati Falls. At Komati Poort we botanised on the Lebombo Mountains in Portuguese Territory.

On the 21st January I accompanied Dr. Pole Evans on a most interesting trip to the Blaauwberg, starting by motor caravan from Potgietersrust in the early morning of 22nd January. About 9.30 we arrived at the farm of Mr. Neethling at Swerweskraal, who had invited us to see the flora of the neighbourhood. A day was spent there very profitably. Next day we travelled towards the Magalakwin River, a large tributary of the Limpopo, on the banks of which I was particularly interested to recognise a rich stand of *Croton Gobouga* S. Moore, the bark of which is a reputed remedy for malaria. Associated with them along the river banks were numerous very fine examples of *Acacia albida* Del., at that time devoid of leaves and looking gaunt and out of place where everything else was green. Dominant in the neighbouring flats was *Terminalia sericea* Burch., with pretty fruits; this tree is one of the commonest in the Northern Transvaal and has very beautiful silky foliage. We followed the "road" on the north side of the Blaauwberg, the rock face on the north side of the range being very beautiful in the evening light, the top obscured by cloud. We slept out that night and I was distinctly relieved that there had been no lions to disturb us as there were at Dongola, near Messina. Next morning we proceeded eastward with the intention of making Pietersburg by evening, but the black turf was too much for the heavy lorry, which frequently sank to the hubs, and we were forced with reluctance to return by the way we had come.

The next few days were occupied in collecting towards Pienaars River with Mr. Mogg, and on a solitary trip to the Belfast district, a very cool part of the Transvaal with a rich temperate flora. I am much indebted to Mrs. Franken, a friend of Mrs. Smuts, for assistance whilst at Belfast. Through her agency a special trip to collect on Mr. Maskew's farm at Suikerboskop was made possible and yielded good results.

On 6th February I started from Pretoria with Dr. E. P. Phillips for a tour of the Western Transvaal by way of Rustenburg, Zeerust, Mafeking, Vryburg, Wolmaransstad and Potchefstroom. At Rustenburg a visit to the Government Experimental Station proved very interesting, especially the experiments of growing tobacco in the various kinds of Transvaal soils. At Vryburg the Government Veterinary Experiment Station was novel to me, and I was amazed at the successful result of bone-meal feeding to cattle in order to

counteract the fatal disease known as *lamsiekte*. At Potchefstroom Mr. Saunders kindly showed us the interesting experiments being carried on at the School of Agriculture. On my return to Pretoria a day was spent at Onderstepoort Veterinary Station, where Drs. du Toit and G. de Kock very kindly showed us around.

On February 14th I said goodbye to the many friends at Pretoria and Irene, who had made my time in the Transvaal so profitable, and started my return journey towards Cape Town. My first stop was at Vereeniging to meet Mr. Leslie, who has an excellent collection of succulents. The journey from there as far as Hoopstad was not a particularly pleasant one. It was mainly on a secondary road which usually meant a rough uncharted track over the veld; the gates seemed to be innumerable, and I lost my way once or twice and several times stuck fast in the loose sand. A spade, loose branches and other expedients had then to be resorted to in order to make progress. I abandoned these secondary "roads" at Hoopstad and recrossed the Vaal by the ferry near Bloemhof and proceeded to Kimberley with much more comfort. The whole of this journey produced very little of interest in the way of plant life, the country for the most part being very dry short grass-land and suffering from drought.

At Kimberley Miss Wilman, Curator of the Macgregor Museum, made me very welcome, and introduced me to Mr. S. Tapscott, well known for his interest in succulents. He accompanied me on a trip across the weird and interesting Kaap Plateau as far as the Asbestos Mountains, at that time in a very dry state. For a day or two we followed Burchell's route and visited the remarkable cave, Blinkklip, which he figured and described. At Kimberley Mr. Powell, a local botanist, kindly acted as guide on some excursions. Horticulture at Kimberley is in a backward state, and it was particularly gratifying to see the fine succulent garden now flourishing in the town, mainly due to the energy and enthusiasm of Miss Wilman.

From Kimberley I journeyed in a day to Bloemfontein, but considering the distance covered I gathered very few species of plants. At Bloemfontein I met Professor Geo. Potts; and Mr. Baker, formerly a student gardener at Kew, showed us how, in conjunction with the city engineer, he had transformed the open spaces into beautiful public and zoological gardens. Bloemfontein should indeed be proud of its achievement, especially of its public baths and surroundings, which were the most beautiful I had seen in South Africa.

Two of my previous companions again joined me, Dr. Phillips at Bloemfontein and Mr. Dyer at Fauresmith, the former returning by train from Middelburg, the latter sharing my adventures as far as Le Roux, near Oudtshoorn. The Fauresmith Reserve should prove of great value to farmers in this part of the Upper Karoo, which is very different from the Lower Karoo and presents different problems. Experimental work with fodder plants likely to be suitable

to this region is being carried on besides purely botanical research. Approaching Colesberg the first serious mishap occurred to the car, which, carrying three passengers and baggage, was very heavily loaded. The radiator burst in a vital spot, and we limped into the town at a snail's pace and with innumerable stops to cool the engine. From Middelburg, our headquarters for a few days, excursions were taken in various directions, and a visit was paid to the Agricultural Experimental Station in charge of Mr. Joubert. A profitable day was spent on the Tafel Berg Hall Farm (Mr. and Mrs. Van Ryneveld), and we climbed to the top of the mountain. Further south Roode Hoogte and Naude's Pass proved fertile collecting grounds.

The town of Graaff Reinet is a vivid contrast to the surrounding country, and shows the fertility and possibilities of the driest parts of the Karoo when provided with a plentiful supply of water. Nearly all the streets are lined by fine trees of *Cupressus macrocarpa*, Pines, and English Elms, and the gardens were full of grapes and figs, etc. In the botanic gardens are some fine trees, but the grounds generally are in a neglected state. The prickly pear has a strangle-hold on much of the neighbouring country. We made a special trip to Kendrew where we found to our great delight numerous examples of *Euphorbia Obesa* Hk. f., and we collected about two dozen examples and transported them to Kew, where they are now flourishing. In the neighbourhood of Aberdeen, after a long search, we located a fine stretch of *Mesembryanthemum Bolusii* Hk. f. I collected a few typical specimens together with a few of the smaller and similarly spotted stones amongst which they grow. These were shown recently at the annual conversazione of the Royal Society and aroused much interest. Our progress to Willowmore was effectually barred by the Groote River, which was flooded as the result of a storm in the mountains a long distance away. We obtained accommodation at the farm of Mr. Greeff at Hoogekraal, who generously made us welcome. At Willowmore the farm of Mr. Codner (storekeeper in the town) was of great interest, and owes its prosperity to scientific irrigation and conservation of water.

The 15th March proved to be an eventful day. The country between Willowmore and Klaarstroom was very dry and drought-stricken, and very similar in many ways to that between Montagu and Barrydale which I had come through on the outward journey. We decided, therefore, instead of staying the night at Klaarstroom, which had failed us for succulents, to continue through Meiring's Poort. In perfect weather we began the descent of the gorge which is a deep rocky defile about 14 miles long, the river at the bottom crossing the road by about 33 drifts. We had collected some interesting plants in the upper portion and were crossing about the tenth drift when the differential gear of the car gave way and we were stranded in about 3 feet of water in the middle of the drift. The story of how we managed to save the car in the subsequent thunder-storm and of our narrow escape from the flood which rendered the

road impassable for weeks, must be told in another place, but it was an experience which will not be readily forgotten. My companion, Mr. R. A. Dyer, was an invaluable help, and I am very grateful to him for all he did under exceptionally trying circumstances. At De Rust, the small village at the mouth of the gorge, the local medical officer, Dr. Smit, and the brothers Du Fosse, were very helpful. During the interval of obtaining spare parts from Cape Town, Mr. Dyer having returned to Grahamstown, I proceeded by train to George and Mossel Bay, where I made collections. The subsequent journey alone through the Robinson Pass, Mossel Bay, Riversdale, Swellendam, Caledon and Hermanus to Cape Town was without special incident, and was made in wet and unsettled weather, which permitted little collecting to be done. I was much impressed during this journey by the vast quantity of the *Rhenoster* bush, *Elytropappus Rhinocerotis* Less., which in that region has everywhere taken possession of the veld.

The last fortnight was spent at Claremont and Kirstenbosch in sorting my collection into sets, in which work Mrs. Bolus very kindly allowed me the help of the staff of the Bolus Herbarium; and in botanising on Table Mountain with General Smuts and Professor Compton. To these and all other friends whom I may not have mentioned I tender my warmest thanks for the help and advice received at every stage of my journeys.

The full story and scientific results of my tour will be published elsewhere. Over 3000 species of plants were collected, and wherever possible sufficient material was gathered for making three or four sets. Two sets were left in South Africa, one at Pretoria, the other at the Bolus Herbarium, Kirstenbosch. As it is my intention to compare carefully with the type specimens at Kew and elsewhere the whole of the collection, the sets left in South Africa should have some value, for systematic work in the Union suffers greatly for the lack of type specimens.

Except for the species described during the last decade from the Bolus Herbarium and other South African Herbaria, practically the only type specimens in South Africa are preserved in the Natural History Museum at Cape Town, and the amalgamation of this herbarium with the Bolus Herbarium would be a distinct advantage. It is hoped that it will be possible to assist South Africa by sending over certain duplicate types and also specimens compared with unique types from Kew. It would then be possible for botanists in South Africa to work out more of their own problems and pave the way to the preparation of regional floras, which are so much needed.

Besides the dried collection I was able to collect at intervals a number of living succulent plants which were forwarded to Kew and are mostly growing well. As the season was on the whole a poor one in South Africa, I was somewhat disappointed at not being able to do more in the way of seed collecting, but as I was mainly in each area during the flowering season this was hardly possible.

I sailed from Cape Town on April 12th on board the R.M.S. *Balmoral Castle*, whose captain and first officer gave every facility for the care of the four wardian cases full of rarities, which Professor Compton supplied from Kirstenbosch for cultivation at Kew, most of which survived the journey very well.

## XLIX.—FASTIGIATE AND PYRAMIDAL TREES : II\*.

VICARY GIBBS.

The Director has asked me to add a supplement to the admirable article on fastigate trees which appeared in the *Kew Bulletin* No. 4, of the current volume. There are a few trees of this kind which have escaped the author's notice, and of which my long experience at Aldenham enables me to give an account. I have always been interested in aberrant types, whether narrowly upright, weeping or contorted. Mr. Bean says, very truly, that nearly every common tree has a fastigate form, if one could only find it. He mentions, as exceptions, the ash, the lime, the sycamore and, with the exclusion of one tree, here at Aldenham, the common elm. As to the ash, I found a fastigate form in Mr. Trotter's grounds at Leith Vale, a year or two ago, and this year we succeeded with two or three grafts, one of which will, I hope, in due course reach Kew. This ash is undoubtedly fastigate, in the sense that all the boughs turn up vertically, but it is not very narrowly so, and is not therefore so effective as the hornbeam when it takes on that form. I have had for a good many years a lime growing here, about which much the same can be said as about Mr. Trotter's ash. This is *Tilia platyphyllos* var. *pyramidalis*, which appears in the Kew Hand List, as does also its golden form var. *aurea*. My plant is a shapely pyramid about 20 feet high and is doing well. I have not yet come across a fastigate sycamore. As for our unique elm, that alas was blown down in a gale about a year ago, but we have preserved, and grafted, some of the wood, so that Kew should not be without this long.

Bolles' White Poplar, which Mr. Bean praises, as most ornamental, is a dismal failure in our heavy soil. Its branches keep dying off, and it consoles itself for this by scattering suckers over a very wide area, so that I should be thankful if it had never been planted.

*Acer saccharum* var. *monumentale* is one of the few narrow forms mentioned as growing at Kew that I do not possess, and the same remark applies to *Alnus incana* var. *Balfourii*. On the other hand I have *Alnus glutinosa* var. *pyramidalis*, which the author has omitted, and which is well worth growing, as it makes a very neat compact specimen. (Plate XII.)

Like Kew, I have two plants of the pyramidal Spanish chestnut, which were originally suckers of the old tree at Mount Mascal; they were given me by the late owner, Sir Vesey Holt.

Besides the *Robina pseudacacia* var. *fastigiata*, and the fastigate form of the var. *monophylla*, which the previous article records, there

\*See *K.B.* 1929, pp. 97–104.



is a third, perfectly distinct and striking form, var. *inermis fastigiata*, which has been growing here for many years, and of which a very good photograph appears in a monograph on Robinias written by me in the Journal of the Royal Horticultural Society for this year.

With regard to the upright growing form of *Ulmus montana*, although it is true that the branches are likely to become decidedly weak and sloppy unless they are trimmed in fairly closely, it is decidedly decorative when this is done.

We have another elm here, *U. nitens* var. *umbraculifera gracilis*, which perhaps cannot be justly included amongst pyramidal trees. The truth is, it is very difficult to draw the line, for whilst no-one can doubt that the Lombardy Poplar is fastigate, or that our common oak is not, there is no hard and fast line, and many trees whose limbs are inclined to be vertical, yet form so broad a head, that they do not produce a fastigate effect. The elm under discussion has no central stem whatever, but a mass of thin twigs all about the same size, all nearly vertical, and forming a very neat bush which some might say was like a mason's mallet, about 14 ft. high by 12 ft. across. In form it is not altogether unlike *Carpinus betulus* var. *pyramidalis*.

Besides the ordinary Irish Yew, there is an exceedingly narrow form, growing here, which was given me by Mr. Hornibrook, and is called var. *columnaris*. It is described by him as having the appearance of a folded umbrella.

Other trees omitted are the very narrowly upright form of Scots Pine which is growing at Glasnevin, of which my plant, about 8 ft. high, is the offspring by grafting; two exceptionally narrow forms of *Juniperus chinensis*, of which we are the proud possessors, viz., the green one, and that which is known as "Young's Golden Juniper"; and a narrowly upright form of *Cedrus atlantica*. I saw the last named two years ago in Anthony Waterer's nursery, but alas it was too old to stand removal and died on me. However, I got some young plants from abroad, in pots, which are bound to be all right. Another addition that should be made to the list of Conifers is *Pseudotsuga Douglasii* var. *pyramidalis*, which is now 10 ft. high at Aldenham, and was noticed by the late Henry Elwes in a nursery.

Besides the pyramidal form of our common birch, I think room should have been found for the dwarf form *B. pumila* var. *fastigiata*, which, though grown here for many years and quite healthy, is only 12 ft. high.

*Amelanchier florida* also, 18 ft. high, is certainly either fastigate or pyramidal.

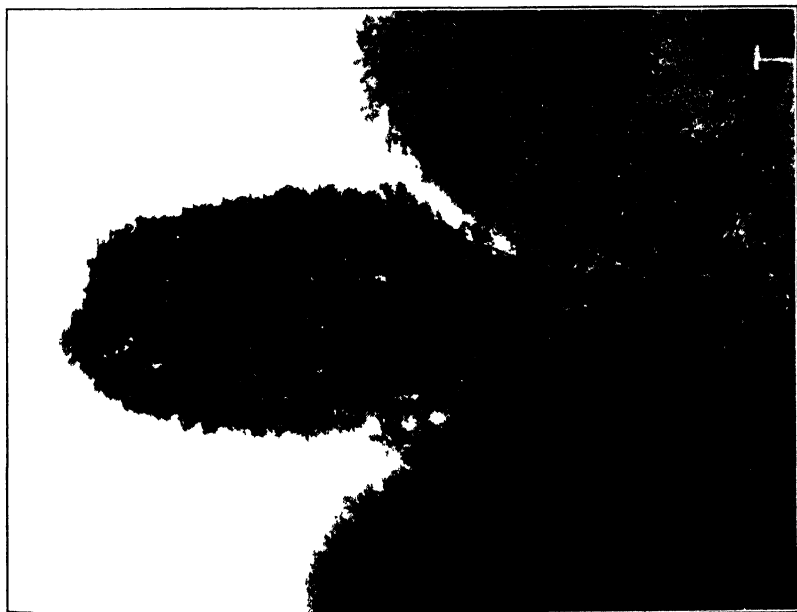
Some of the edible pears also, such as "Charles Ernest," of which we have a plant 16 ft. high, are unquestionably fastigate in form, as also is the crab apple *Pyrus malus* var. *magdeburgensis*, 13 ft. high.

I will finish off with two fastigate forms, which can hardly be said to grow to the dignity of trees, but whose narrowness justifies my mentioning them. The first is *Sambucus nigra* var. *fastigiata*.

PLATE XII



*Abies glutinosa pyramidalis*  
at Aldenham



*Sambucus nigra fastigiata*  
at Aldenham



A charge of "inelegance" has been brought against it, but, as the photograph (Plate XII) shows, it can be very effective, if judiciously placed, and as it makes a very solid column, it might well serve to block out buildings in some small garden, where a change from the ordinary Lombardy Poplar was required, and great height unnecessary. Our oldest plants are about 20 ft. high by 10 ft. through. If they had only been reduced to a single stem when young, as ought to have been done, they would have been decidedly taller and narrower. Moreover, it has the advantage of being a rapid grower. Strangely enough, although it is not, so far as I know, botanically different from the ordinary common elder, this form seems hardly ever to flower, and never to fruit. Of course this is a great merit, for no one wants seedling elders all over their shrubberies.

The second plant of the sub-tree, or shrub, order, is the narrow form of *Aralia chinensis*. It has the advantage of taking up less room than the type, and the disadvantage (which is not nearly so evident in the American form, *A. spinosa*) of suckering too freely.

I can think of nothing else to add, except *Ginkgo biloba*. When one sees this tree in North Italy it has long sweeping branches, whereas nearly all those one sees in England have very short boughs. However, in the case of one tree here, which is about 26 ft. high, and only 5 ft. across at its widest, the form is indubitably fastigate, for nearly all the boughs are not only very short but turn straight up, parallel with the stem.

I am greatly indebted to Mr. Vicary Gibbs for his interesting article supplementing the account of fastigate trees published in the Bulletin and this seems an appropriate place to add one more tree to the list.

During a visit to the Hortus Bergianus, Stockholm, in July, Professor R. E. Fries pointed out to me specimens of a fastigate form of *Populus tremula*, which as far as I am aware has not hitherto been recorded. The trees are closely similar to the Lombardy Poplar in habit and it is hoped that examples may soon be seen at Kew, as specimens have just been received from Stockholm.

A. W. H.

## L.—SOME IMPRESSIONS OF SWEDEN.

W. DALLIMORE.

The International Congress of Forestry Experimental Stations, held in Sweden between July 14th and August 4th of the present year, offered an excellent opportunity of obtaining an insight into problems connected with Swedish silviculture, and the extraction and conversion of timber. At the same time it was possible to pay attention to other questions concerning the country and the people, and in the following notes some of the more important impressions are recorded.

The Congress had three distinct phases. First, an excursion through some of the forests of Southern and Central Sweden,

Skånia and Dalecarlia, lasting from July 14th to July 20th. Then the full Congress at the Forestry College, Stockholm, July 21st-July 28th, which was followed by a further excursion to the forest regions north of Stockholm, extending from July 29th to August 4th. During the tour the country was traversed from Malmö in the south to Stor-Uman in Lappland in the north, and from Stockholm in the east to Åre in the west ; thus it was possible to study silvicultural problems under widely different conditions of soil and climate.

One needs to be in Sweden but a very short time in order to appreciate the great forest wealth of the country, and to realise to what a considerable extent the prosperity of the six million inhabitants is bound up in forests and timber, though there are of course other sources of occupation and wealth. The country is rich in certain minerals, agriculture is of importance, especially in the south, shipping and fishing find employment for many people, and so on ; but all appear to be subservient to, and more or less dependent upon, trees and an adequate supply of timber. There is agricultural land in plenty but even in agricultural districts forests are still the dominating feature of the country side. Trees cover the hills and take possession of ground too poor for agricultural crops, whilst in the vicinity of some of the towns the forest is barely separated from the suburbs. Sweden is rich in lakes, rivers and inlets from the sea, and there again the water line alone limits tree growth. Everywhere, as far as the eye can see, Spruce and Pine dominate the landscape.

Before discussing the various forests visited and the work of the Congress, something more should be said about the country and the people. Sweden extends about 1000 miles from south to north, and as the most southerly point is in about the same latitude as Newcastle-on-Tyne, very varying conditions of life are to be expected. In the south they appear to compare favourably with average conditions in the British Isles, but in the north no doubt the people experience much greater privations. The utilisation of water-power for generating electric current and the transmission of cheap current throughout the country, has been a boon to the people. Most of the houses now have electric light, and farmers and others are able to use electric current for various purposes connected with their business. It is of interest to note that Denmark is supplied with its electric power from Sweden. Telephone and wireless installations have also helped to make the conditions of life easier for the people living widely separated in the rural districts.

In the country most of the houses are built of wood, painted with a venetian-red, oil-less wood-preservative, which is said to be made of ferric oxide, copper sulphate and rye flour, and to be used in a warm state. The red colouring is relieved by white window-frames, and the whole effect is singularly appropriate to the surroundings. The country throughout has a very clean appearance and housewives are very fond of board floors, scrubbed to a degree

of whiteness that is usually only associated with the top of a well-kept kitchen or dairy table. In towns and villages alike the love of flowers was very noticeable and the windows of houses were usually filled with well-grown 'geraniums,' fuchsias, begonias, ferns and other plants. The towns are well furnished with parks, gardens and avenues, many of them unfenced. They are well kept, and visitors are careful to keep them tidy; paper or other litter is not thrown about. Plenty of seats are provided and they are put to good use; visitors are rarely seen sitting or lying on the grass. Moreover they rarely walk on the grass. Private gardens of houses are usually well tended and in many places effective displays of summer-flowering plants are made on the railway stations. Very few dogs were noticed about the streets in the towns, and coal fires are not general in houses, two factors which no doubt contribute very largely towards the general cleanliness. A great deal of wood, chiefly birch, is used for heating purposes, and neat, usually round, stacks of chopped wood, often 12 or more feet high, may be seen near every house.

The main features of the parks are trees, shrubs and grass, frequently water; there is some flower gardening but not a great deal. Here and there may be seen beds of roses, usually masses of single kinds, but many of the garden roses are too tender to withstand the winter cold. *Rosa rugosa* is the hardiest exotic rose and is commonly grown. In Southern Sweden a considerable variety of trees and shrubs succeed in the parks and gardens, but as one proceeds north, species decrease in number, until very few are found. *Syringa vulgaris*, *Lonicera tatarica*, and *Spiraea salicifolia* are amongst the commonest and most widely distributed garden shrubs, whilst the latter was practically wild in some places. In northern gardens *Syringa Josikaea* and *Lonicera tatarica* give excellent results. *Pterocarya caucasica* succeeds very well in Southern Sweden, whilst the fastigate form of the wych elm (*Ulmus montana* var. *fastigiata*), is very popular in parks and gardens. The two commonest avenue trees are *Tilia vulgaris* and *Betula verrucosa*, whilst the horse chestnut is planted in some places. As seen in Sweden the birch is the most effective road and street tree imaginable. Of moderate growth and graceful habit, it can be allowed to develop to its full size, even in comparatively narrow roads.

*Aristolochia Siphon* and *Lonicera Periclymenum* are two of the commonest climbing plants used in Sweden, whilst the most conspicuous hedge plant is *Caragana arborescens*, and a very good hedge plant it makes. Other hedge plants are whitethorn, *Pyrus Aucuparia* and *Ulmus montana*.

In and about Malmö, apple, pear and plum trees are seen in many gardens but crops of fruit were poor. Apple and pear trees grow as far north as Central Sweden but fruit was scarce, and I was informed that a crop rarely matures more often than once in five or six years. Small fruits such as gooseberries, black and red currants,

raspberries and strawberries are widely grown and they were cropping well, in fact there were heavy crops of red currants in Lappland. Wild strawberries are very common in some parts of the country, and they were being gathered in large quantities for home consumption and for market.

Tomatoes, cucumbers, melons, lettuces, radishes, carrots, cabbages, cauliflowers, beetroots, fennel, beans and peas are regular market garden crops, and they are seen in all the markets with the small fruits mentioned above.

There is a good collection of trees in the public gardens in Malmö, and that a considerable variety can be grown in Stockholm is evident from the number seen in the Hortus Bergianus. Some of the most conspicuous were :—*Picea Omorika* 50 ft. high, *P. jezoensis*, *P. alba*, *P. excelsa* and a wide range of its varieties, including a form with proliferous cones, and the native variety *virgata*. *P. Engelmanni*, *P. pungens* and var. *glauca*, *P. obovata*, *P. orientalis*, *P. Schrenkiana* 35 ft. high, *Abies sachalinensis*, *A. Veitchii* 40 ft. high, *A. concolor*, *A. homolepis* 30 ft. high, *A. cephalonica*, *A. subalpina* 20 ft. high, *Pseudotsuga glauca*, *Quercus rubra*, *Corylus Colurna* 20 ft. high, *Populus tremula* var. *fastigiata*, a variety hitherto unknown to us in England, and many others. There are trees of *Quercus pedunculata* 3 ft. or so in trunk diameter, and others almost as large in the grounds of the Forestry College near by, although the species finds its northerly limit 20 miles north of Stockholm. Several Western N. American Conifers were noted growing well considerably north of Stockholm, but more conspicuous trees were *Pinus Cembra*, sometimes much more open in habit than Swiss trees, and *Abies sibirica*. Here and there *Larix europaea* was noted, usually covered with *Chermes*, and a small plantation of *Larix sibirica* was seen in Lappland. On the Karsholm estate, Kristianstad, a tree of *Liriodendron Tulipifera* about 50 ft. high and 5 ft. 1 in. in girth at 4 ft. from the ground, was noted. At Skokloster, between Stockholm and Upsala, there is an exceptionally fine avenue of old trees of *Tilia vulgaris* which have the appearance of having been severely pruned or pollarded at an early period of their existence.

Agriculture appears to have attained a high standard of perfection in Southern Sweden. The plains of Skåne are largely composed of very fertile land ; there, excellent crops of wheat, barley, rye and oats were beginning to ripen. The hay crop was particularly heavy. An oat and vetch mixture is grown for green fodder, and lucerne is cultivated in some places ; there were large tracts of sugar beet and potatoes, and tobacco is also grown. Away from this fertile area farming becomes more difficult. A great deal of the land is strewn with large boulders and it is only after the laborious removal of huge stones that the ground can be worked at all. Moreover, in places where land clear of stones is found, the climatic conditions are less favourable than in Skåne. Potatoes are grown in large quantities in the warmer parts of the country, and even in Lappland

small areas are planted. Many of the potatoes grown on peaty soil are distilled for alcohol, and special varieties have been selected for planting in the colder districts. Barley appears to be grown further north than any other corn crop. Farmers were in the middle of the hay harvest at the time of my visit. Hay is not made as in England, but the grass, soon after cutting, is placed on wooden racks and dried. The racks are of varying length and 5 to 6 ft. high, with about five rails. The lowest rail is placed in position and on it a generous layer of grass is hung. Another rail is added on which more grass is placed, and so on until the rack is filled. Women assist in the work. A good deal of the hay appears to be rye grass and clover, but in some places there is meadow hay. In the south of Sweden Friesian cattle are preferred to other breeds. In Central Sweden there are a good many apparently cross-bred Ayrshire cattle, which further north give place to a North Swedish polled breed, mostly white with black or brown blotches and streaks. This breed is said to be very hardy, and gives milk rich in cream. There is also a North Swedish type of horse; a small sturdy animal with short, stout legs, heavy neck and shoulders, rather short body and heavy mane and tail. These animals appear to be of considerable strength for their size, and they are stated "to be considered the most suitable for work in the forests where they often have to be driven through deep snow and over bogland. A small horse of this breed is expected to pull a load of 3 to 4 tons."<sup>1</sup>

Agricultural land in Sweden is said to be limited to 10 per cent. of the country.

**Conspicuous Wild Plants.**—On a tour devoted to silvicultural questions it is only possible to pay passing attention to other matters and this was so with the general flora. The undergrowth in the different forest areas varies considerably, but as a rule there are a few dominating plants with others in small numbers. However, in passing through the country an idea of the general flora is obtained and opportunities occur of noting a few striking plants. Three forest plants that appear almost everywhere are *Linnaea borealis*, *Vaccinium Myrtillus* and *V. Vitis-Idaea*.

In many respects the general flora of Sweden bears a close resemblance to that of England, and numerous familiar British plants were noted throughout the country. *Epilobium angustifolium* was everywhere, sometimes in very large masses and particularly rich in colour. *Filipendula* (*Spiraea*) *Ulmaria* was also common from south to north, its fragrant flowers making their presence known from a considerable distance. *Silene Cucubalus* and *Lychnis dioica* were of general occurrence, the pretty blue flowers of *Campanula rotundifolia* were constantly in evidence, wild strawberries (*Fragaria vesca*), made the ground red in some places and the berries were being gathered and marketed by the bushel; *Juniperus communis* in varying habit, from prostrate plants to vigorous erect bushes, was

<sup>1</sup> Kramfors Aktiebolag, its Development and Organisation, 1929, p. 29.



very common ; *Vaccinium Myrtillus*, *V. Vitis-Idaea* and to a less degree *V. uliginosa* grew in both shady and exposed places ; the bird cherry was seen from south to north, as were other familiar plants. Two very attractive wild plants in southern Sweden were *Campanula persicifolia* and the cornflower (*Centaurea Cyanus*). The former appeared in groups of varying size in grass land and by the sides of roads, whereas the latter was very effective amongst the ripening corn. These two blue-flowered plants, with *Campanula rotundifolia*, the red-flowered willow herb, the cream-coloured meadow-sweet and several large, white-flowered Composites, especially chamomile, were effective over large areas of ground.

In the woods one of the first plants to attract attention was *Linnaea borealis*, and it was a common plant to the end of the tour, varying somewhat in the size of the flowers and widely in the inner colouring of the corolla, but always the same dainty, intriguing plant. Hitherto I had only known *Linnaea borealis* under cultivation, and had thought it unworthy of commemorating the name of the great Linnaeus. My visit to Sweden caused me to alter my opinion. Growing amongst the mossy undergrowth of the forests, it appears as one of the daintiest plants imaginable, while its bell-like flowers add a delicious fragrance to air already sweet with the perfume of pine, spruce and birch. The name of the great naturalist could not have been given to a more appropriate or charming plant. Lily of the Valley is common in many places and several forest areas were carpeted with *Anemone Hepatica* and *A. nemorosa* ; *Anemone vernalis*, however, was rare. Several orchids, including *Listera ovata*, *Habenaria bifolia* and its variety *chlorantha*, *H. odoratissima*, *Goodyera repens*, and *Orchis maculata* were noted. There were many ferns ; the oak fern (*Polypodium Dryopteris*) was particularly common, in fact it is used to designate a type of forest soil as at Flottaforsmyren in Lappland, where a mixed forest of pine, spruce and birch was officially described as being partly of the *Sphagnum*-rich *Dryopteris*-type and partly of the herbaceous type. The beech fern (*Polypodium Phegopteris*) was often found but in smaller quantities than the oak fern. At the waterfall of Tännsforsdön near Åre a rare fern, *Cystopteris montana*, was noticed. *Gypsophila fastigiata*, which is said to be rare in Sweden, was found forming dense, deeply-rooted tufts on sandhills at Kumbelnäs near Mora, and in this place *Arctostaphylos Uva-ursi* was proving useful as a sand binder. *Majanthemum bifolium* was very common in forests, and mosses, including several club mosses, were luxuriant. The following plants in addition to those before mentioned were frequently met with during the tour. *Stellaria nemorum*, *Lathyrus vernus*, *L. sylvestris*, *Vicia sylvatica*, *Convallaria majalis*, *Polygonatum officinale*, *Lamium Galeobdolon*, *L. bifidum*, *Asperula odorata*, *Anchusa officinalis*, *Lycopodium clavatum*, *L. anotinum*, *Arabis arenosa*, *Thalictrum simplex*, *Dianthus deltoides*, *Galium album*, *G. uliginosum*, *Pyrola intermedia*, *P. rotundifolia*, *P. secunda*, *Moneses* (*Pyrola*)

*uniflora*, *Nymphaea alba* var. *candida* (a name given in Sweden to a form that appears to be smaller flowered than *N. alba*), a pink-flowered form also occurs wild in Sweden and is protected, *Parnassia palustris*, *Calla palustris*, *Pinguicula vulgaris*, *Drosera rotundifolia*, *Geranium silvaticum*, *Viola biflora*, *V. tricolor*, *Cornus suecica*, *Paris quadrifolia*, *Calluna vulgaris*, *Erica Tetralix* (occasional in the south), *Rubus Idaeus*, *R. arcticus* in the north, *R. Chamaemorus*, *Betula nana*, *Andromeda polifolia*, *Ledum palustre*, *Empetrum nigrum*. In the mountains about Åre, *Loiseleuria procumbens*, *Phyllodoce coerulea*, *Alchemilla alpina*, *A. alpestris*, *Saxifraga azoides*, *S. stellaris*, *S. oppositifolia*, *Salix herbacea*, *S. glauca*, *S. lanata*, *S. repens*, *Arctostaphylos alpina*, *Bartsia alpina*, *Astragalus alpinus*, *Gentiana campestris*, *Pinguicula lapponica*, *Sieboldia procumbens*, *Diapensia lapponica*, *Silene acaulis*, *Erigeron acris*, *Cerastium alpinum*, *Veronica alpina*, *Selaginella selaginoides*, *Lycopodium alpinum*, *L. Selago*, *Viola uniflora* and *Aconitum Lycoctonum* var. *septentrionale*, the latter in damp and sheltered situations attaining a height of 8 feet, were seen.

**Forests.**—The forests of Sweden are computed to cover about 57 per cent. of the country, or about 23·6 million hectares. They are owned partly by the State and partly by companies and private owners, whilst there are some communal forests. In most instances the holders own very extensive areas, and in both State and private forests highly organised systems of management have been evolved, the systems changing somewhat from time to time, as it becomes necessary to meet growing demands for different qualities of timber. At one period there was a very considerable demand for small timber for the manufacture of charcoal for iron smelting, and the smaller classes of timber were encouraged. There is still a considerable demand for charcoal, but pulp wood and heavy classes of timber are more valuable, therefore wider spacing of trees and a longer rotation period are being put into practice.

A system of selection-felling prevails in most places ; sometimes limited areas are clear cut, or group-felling, practised. As a rule a particular system of management is applied to a very large area, but here and there different systems of management are noticed, almost side by side, in restricted areas. This is explained by the prevailing communal forest system. From what could be learned communal forests were in the first instance divided by a strip system of partition between a few families residing within their limits, the strips running through the entire length of the forest. On the death of an owner his section was divided amongst all his sons and daughters, the strip method of division still being followed. This has gone on until some of the strips may now be only a few metres wide and as much as ten kilometres long. The law allows one or more members of a family to purchase the interests of others, but the forest or portions of the forest cannot be sold to a company. The system naturally results in a multiplicity of owners, hence the different systems of management that prevail side by side.

Timber from state forests is sold to various lumber firms, but the timber cut in company-owned forests is often sawn or otherwise used by the company concerned.

Some of the forest-owning companies have very wide interests, not only in timber but in other industries to which the use of wood in one form or another is complementary. Thus the Stora Kopparbergs Bergslags Aktiebolag—*i.e.*, The Great Copper Mountain Company Limited—and for general use shortened to The Bergslag Company, has very extensive agricultural, forestry, mining and manufacturing interests in Central Sweden, largely in Dalecarlia and Norrland, with headquarters at Falun, and extensive mills at Skutskär on the Gulf of Bothnia, to which timber is floated down the Dalälven river. The Company owns very rich ore deposits, about 1,000,000 acres of forests, of which 750,000 acres are productive, and controls water power to the extent of 200,000 horse power. The Kopparberg Mountain at Falun was the original source of the company's activities, and as early as the thirteenth century the founders of the company were working copper from the Falun mine. Almost from that time the company, which claims to be the oldest Joint Stock Company in the world, has been interested in forests; in the early days in connection with timber required for the mine, and in modern times to meet the demands of numerous developments. It is interesting to note that from the company's records a great deal of timber was required in the early centuries for fuel as well as for building purposes. The mine was worked by lighting large fires of wood to heat the rock, after which water was poured over the rock to make it crack. The large consumption of wood necessitated the company turning its attention to forests and the present extensive holdings were thus gradually built up. Charcoal has always been required in large quantities by the company for smelting purposes, and at the present time, in their Bysjön Works at the Tuna Rapids, in the river Dalälven, there is an annual output of 4,250,000 cubic feet of charcoal, 1,800 tons of wood tar, 1,000 tons of acetate of lime, 150 tons of methanol (methyl alcohol), 65 tons of miscible wood naphtha, 35 tons of allyl alcohol, and 150 tons of wood tar oil. In addition to the charcoal made in special retorts at the Bysjön Works a large quantity is made in forest charring stacks, enough in fact to make up the 6,000,000 cubic feet of charcoal required each year for the production of 60,000 tons of pig iron when made in electric pig-iron furnaces. From their Kvoensveden Mills on the same river, 70,000 tons of paper and building board, made chiefly from spruce, is turned out annually, while the company advertise their annual production of sawn wood as 35,000 standards.

At Falun the company has an extensive and well-arranged museum, in which its activities from early days are demonstrated. An idea of the company's interests and its position in industry may be gathered from the foregoing figures and the fact that amongst other manufactures, the Domnarfvet Steel Works, belonging to the

company, turn out 125,000 tons of finished iron and steel per annum ; the steel manufacturing plant produces 3,500 tons of rail spikes, bolts and cut nails, as well as crowbars, axles, etc., whilst a basic slag mill has a capacity of 16,000 tons of fertiliser per annum. The higher staff at present numbers about 500 ; regular workmen 6,000 ; seasonal workers, agriculture and lumbering, about 2,000. Including the families of permanent employees, it is estimated that 25,000 people are dependent for their livelihood upon this important company. The company has excellent welfare schemes for the benefit of their employees, which embrace housing, medical attendance, pensions, etc. ; and it certainly appears to be a model of industrial organisation. This is one of many similar companies operating in forestry, timber and timber-producing commodities.

In the southern parts of Sweden, and more particularly in the fertile regions of Skåne, broad-leaved trees abound, and at different points in this province, spruce and Scots pine are said to find their southern limit of natural distribution in Sweden. Beech is the most important broad-leaved tree in Southern Sweden, pedunculate oak, mountain elm, aspen, ash, common and grey alder, goat and crack willow, and a few other trees occurring in mixed forests or near water. Mountain elm (*Ulmus montana*) is the prevailing elm. *U. laevis* also occurs, but I did not see it in quantity. In favoured localities beech grows to a considerable size, 90 to 100 ft. high, with old park trees upwards of 2 ft. in diameter ; forest trees are equally tall but less in diameter.

Further northwards the land becomes less suitable for agriculture and a high percentage of the country is covered by profitable forest. Much of the land is strewn with large boulders ; where farms have been established a great deal of labour has been expended upon the removal of huge stones. As Central Sweden is approached, broad-leaved trees become scarcer until the only one left that has any considerable commercial value is birch. *Alnus glutinosa*, *A. incana*, *Populus tremula*, *Pyrus Aucuparia*, and *Salix Caprea* are found very far north but not in commercial quantities. *Pyrus Aucuparia* in Norrland and Lappland is used as a hedge or screen, and is often planted in a circular manner to enclose seats.

Wherever satisfactory soil conditions prevail, pine and spruce are tall and clean but never of large girth, rarely more than 4 ft. at breast high. The tendency at present, however, is, by greater thinning, to increase the size of the trees. They are of slow growth and natural regeneration prevails in most places. Where conditions are not very suitable for regeneration, assistance is given by tearing up the surface soil by means of forest ploughs or by depositing seeds in prepared patches of ground 3 or 4 feet apart. In low-lying, wet, peaty areas, tree growth is often unsatisfactory or impossible, as it is in the British Isles, and the discovery of means whereby these peaty soils may be turned to profitable account, is one direction in which silvicultural research is being conducted in Sweden and in other countries.

There does not appear to be any waste wood in Sweden. Selected trees are in request for masts and telegraph poles, then the largest timber is sawn into planks and scantlings; of smaller timber a large quantity of birch is used for firewood; medium-sized pine and spruce with slabs and short ends of sawn timber, is used for paper pulp, whilst a good deal of small wood is made into charcoal, for use in iron smelting. Badly-shaped poles are in common use to support the wires of private telephone lines and electric current cables. The best birch is used for furniture and panelling and is very effective in the railway station at Ostersund and other places.

Except in the south of Sweden none of the timber is of large dimensions, although the trees are tall, 70 to 100 feet. That sawn into planks is rarely more than 12 to 15 in. in diameter and the pulp wood up to 8 in. It is barked when cut, and much of it is allowed to season in stacks for some months before being sent to the mills, in order to facilitate floating. It is taken to the water-ways in winter and commences its journey down-stream as soon as the ice breaks up, floating being continued until the rivers are again closed by ice. Every log is marked with the mark of the firm to which it belongs and the wood of many firms is sent down together. At suitable points there are sorting booms where the logs are sorted and diverted to the mills of the various owners. The Sandslån timber-sorting boom on the Ångerman River, one of the biggest rivers in Norrland and an important rafting course, was visited to study the method of sorting. The logs for 90 firms are sorted at this boom. A very large acreage of water is divided up into compartments separated by floating plank-pathways. In the first place the flow of the water is so controlled that the logs are diverted to a particular point and their journey checked. They are then directed into a channel or funnel-shaped flume where they float, 'broadside on,' that is to say with their ends pointing across the stream. From this channel there are openings into the various compartments. Men stand on the pathways and with long, spiked poles shoot or drag the logs into the various compartments to which they belong. As a firm's logs are sorted so the logs are made into rafts by means of machinery, pulp logs being fastened together with strong wire, and heavier logs by means of chains. At this particular boom, which is said to be the largest in Sweden, 750 men are employed in sorting from May to October. They work in two shifts of eight hours each, and 18,000,000 logs are stated to be sorted annually. All the floating and sorting work on the Ångerman River is done by the Ångerman River Floating Association. Owners of timber deliver their timber ready marked to the sides of lakes or rivers, or on the ice, at any point from the Norwegian frontier to the coast. From that time the Association is responsible for delivery at Sandslån to the rightful owners.

On arrival at a mill most of the timber for sawing purposes is taken by machinery direct from the water to the saw bench; some

is stacked for winter sawing, but such wood is returned to the water before sawing, the pools at up-to-date sawmills being warmed to keep the water from freezing. As the wood is sawn into various sizes it is sorted, and either stacked in the open to season, or is run direct into a drying kiln. Where timber and pulp mills are worked by the same firm all waste sawn timber is chipped up and sent to the pulp mills. In other mills waste timber is turned into charcoal or distilled. As much as possible of the handling of sawn and unsawn timber is done by machinery.

A good deal of the small wood, tops of trees and small thinnings, is turned into charcoal in the forest, about 50 cubic metres being built up on one hearth. When small wood for charcoal has to be floated, before it is calcined, it is made up into bundles about 18 in. wide and deep, and about 12 ft. long. Years ago the production of charcoal was a profitable business; at the present time that produced in the forest is said to do little more than pay expenses, and attention is being directed to the production of timber for paper pulp rather than charcoal. Thinning experiments are being undertaken with a view to ascertaining how the greatest yield of pulp wood and saw timber may be maintained.

In addition to sawn timber and pulp, the manufacture of doors, window frames, the match, wood wool and other industries absorb a great deal of labour.

Of the three common trees of Sweden it is possible that pine is the commonest, but in many directions there appears to be a distinct tendency for spruce to increase in area at the expense of pine. *Picea excelsa* under cultivation in Great Britain is a very variable tree in habit, size of leaves, cones, etc., and the same differences are noticeable when it is growing under natural conditions. Many specimens were examined in different parts of Sweden from trees growing upon wet, and upon drained land, and it was found that the same variations existed under all conditions. Side by side trees young and old were found with glabrous young shoots, or pubescent shoots, while others had only scattered hairs in the channels. At the same time some trees had almost horizontal branches, others drooping branches. On some trees the leaves were almost as short and dense as those of *Picea orientalis*, on others they were much longer and more thinly disposed. On certain trees the cones were 6 inches long, on others half that length. The cone scales were in some instances long, truncate and deeply notched, in others they were much shorter and almost as round as those of *Picea obovata*. The curious variety *virgata*, a rare tree in Swedish forests, was seen at Hornberga, and in that forest an area is composed of this variety. The trees vary a good deal in habit, but many produce the long gaunt branches peculiar to the variety. Seedlings raised from seeds from these trees exhibit a wide range of habit.

In the mountains about Åre spruce rarely ripens seed, and reproduction is almost entirely by branches from the lower parts of the

trunk, which take root and gradually form new trees, or from shoots appearing from dormant buds at the base of the trunk. These trees present a distinct and curious appearance.

The Scots pine also varies in habit and length of needles but the variation is in type rather than in individual trees. Thus in the north the branch system is more compact and the needles shorter than in the south, in fact the northern type is known as *Pinus sylvestris* var. *lapponica*, and when growing in the colder regions it is said to retain its needles for 5 or 6 years. If taken southwards, however, its needles may be cast at the end of three years.

Both *Betula verrucosa* and *B. pubescens* are represented, the latter being known as *B. odorata*, and between them there are many hybrids. Of the two, *B. verrucosa* seemed to be the commoner tree.

The tour of forest areas was so arranged that the research work that is being carried out by the Swedish Institute of Experimental Forestry could be demonstrated. Sample plots, some of which have been under observation for many years, were examined in all the forests visited, and a great deal of information was forthcoming as to the rates of growth of trees growing on different soils and under different climatic conditions. On the whole fairly wide spacing is advocated for the mature crop, and in the northern forests it has been found that young trees must be well thinned, as with wide spacing the ground becomes warmer in early summer than with close spacing, hence a longer growing season is obtained. A good deal of experimental work is also in progress with regeneration problems. Mosses and lichens often cover the ground to a considerable depth in Swedish forests and such a covering does not encourage regeneration of trees, hence various methods of ground preparation are under trial. In the warmer parts of Sweden a certain quantity of seed is produced each year by the commoner trees with frequent good seed years, but in the colder parts good seed years are only at long intervals, averaged at 25 years. In some places where seeding experiments are being carried out, positions about 12 or 15 inches square are dug about 4 ft. apart, and in those positions a few seeds each of spruce and Scots pine, or of spruce, with the tree form of mountain pine (*Pinus montana* var. *uncinata*), and Scots pine, are sown, the object being to let the different kinds begin life together and prove by development which is the best species for the particular conditions. In some of the more northerly forests increment is very slow, although in some parts of Lappland the forests appeared to be as well stocked, and the individual trees to be as good as in more southerly regions. In the north the growing period is a very short one and as seed years are at very infrequent intervals, natural regeneration is a very slow process.

A company known as Kramfors Aktiebolag operates on a very extensive scale in Norrland and Lappland. This company owns about 939,000 acres of forest and employs a very efficient forest staff. In their Bosundet Forest near Hoting, which is about 3500

acres in extent and is situated at an altitude of 800 feet above sea level, the company's forest officers are carrying out extensive investigations on the effect of thinning upon the growth of trees and the soil temperature, and they have ascertained that by extensive thinning the soil temperature can be raised earlier in summer to a point that permits of tree growth than when closer stands of trees are left. They attach very great importance to the raising of the soil temperature by even a few days in advance of the normal on account of the naturally short growing season. In the third week of July of the present year, frost was still present in the soil, in dense stands, a little below the surface. In order to demonstrate how difficult the conditions prevailing in that region are, a small stand of Scots pine was pointed out. The trees had died during the present year, and on investigation it was found that the peat in which they were growing had become very wet at some period, and in the third week of July the roots were still coated with ice so that transpiration was impossible.

The firm has a nursery in this forest where experiments are being carried out with about 130 different kinds of foreign trees and shrubs.

As this firm is typical of the timber trade in Northern Sweden a few words on its origin and activities may be of interest. The founders were two traders, Erik Reselius and Johan Sellström and they, in conjunction with others, decided in 1742 to build a saw mill. They got an expert saw-mill builder, Christopher Kramm, to come over from Finland to build the mill and building was completed in 1744. By resolution of the Board of Trade, dated November 24th, 1744, the company was given permission to use a saw mill with fine-bladed saws at Sqvällsan or Kramfors, and until further provision, to fell trees in the valleys of the north and south rivers to the extent of 4,000 trees per annum, for sawing at the said fine-bladed mill. Round about this site have been erected the important buildings of Kramfors' industrial undertakings. From 4,000 trees cut in the earlier years there has now to be contrasted the 1927 total of 6,379,437. From the year 1745 to 1927 inclusive, the firm felled 91,300,899 trees. The firm could only develop as waterways were improved and floating operations made easier, therefore a good deal of pioneer work had to be undertaken in the Ångerman River and tributaries, by the improvement of the river bed, the erection of dams, guiding structures and so on. The company's logs are sorted at the Sandslån sorting booms previously described, and are taken from there to the respective mills by a fleet of tug boats.

At present the company exports 25,000 to 30,000 standards of timber per annum and 12,000 cubic fathoms of pit props. The number of logs required in 1927 for the production of 26,912 standards of sawn timber was 889,553. They have a sulphite pulp mill with a capacity of 58,000 tons per annum. In order to utilize the cellulose sugars in the spent digesting liquor from the sulphite



mill, there is a plant for the manufacture of alcohol. This has a yearly capacity of 1,200,000 litres of absolute alcohol. It is estimated that a log of 3 to  $3\frac{1}{2}$  cubic feet yields 1 litre of 50 per cent. alcohol. There is also a mill for the manufacture of sulphate pulp, with a capacity of 24,000 tons per annum. Wood pulp is sold by the company to 22 different countries. The company has its own electrical power station of about 18,000 effective horse power, at Edsele on the River Faxa about 90 kilometres from Kramfors. At the present time the company's own forests supply about 40 per cent. of the firm's timber requirements, 60 per cent. being purchased. The forests owned by the company are divided into 13 districts, each in charge of an inspector. These are subdivided and the sections are in charge of 30 foresters, the whole being under the control of Mr. E. Ronge, the Head of the Forestry Department. The company takes a great interest in the welfare of its employees and there are numerous official and semi-official organisations with this end in view. The above particulars are taken from memoranda provided by the company.

In a pamphlet entitled "Sweden and Her Forestry," published in Stockholm in 1928 for the Swedish Forestry Society, the following figures are given indicating the ownership of forest areas in the three provinces, Norrland, Svealand and Götaland :—State forests proper 3·8 million hectares ; other public forests 1·4 million hectares ; limited companies 6·7 million hectares ; large landlords 1·3 million hectares ; smaller landlords 10·4 million hectares. The same publication gives the total timber available in Sweden as 1,675 million cubic metres over bark measure, and the annual increment of the forests as 45·7 million cubic metres inside bark.

In a lecture given by Professor A. Wahlgren before the Swedish Forestry Society in 1928, some particulars are given regarding the present progress of Swedish forestry. The forestry question appears to have been given a good deal of attention during the nineteenth century but to have come in for much greater notice early in the present century and to have developed accordingly. He said :—

"The means by which this development has been furthered have, apart from the favourable economic conditions, been :

1. The State assuming a wider, properly balanced control of the care and management of private forests in conjunction with increased grants from public means towards private forestry ;

2. The establishment of a State Experimental Institute of Forestry whose task it was to enquire into the biological conditions for a good growth of forest and into the circumstances which affect an economic exploitation of the same ;

3. The transfer of the higher tuition in forestry to a College with a more scientific character, and an improvement in the tuition at the State Schools of Forestry ;

4. The support of forestry scientific research in other directions, *inter alia* by the establishment of a special fund, from which grants could be obtained for carrying out forestry scientific research ;

5. The organisation of societies for disseminating a knowledge and comprehension of conscientious dealing with matters relating to forestry."

He then, in the following words, describes the provisions made by Parliament for safeguarding future supplies, more particularly in the smaller privately-owned forests :—

"As long ago as the year 1903, Parliament passed a General Forestry Act, to come into force as from the year 1905, within those parts of the country where there were no special forestry laws. The main purport of this General Forestry Act was to secure satisfactory regeneration. For looking after the application of the Act there was established a separate and special Institution, the so-called Forest Conservation Board, one for each county revenue district within those parts of the country to which the Act applied. Every such Forestry Board, which consisted of 3 members, of which one was appointed as Chairman by the Crown, received at its disposal a highly-trained forestry man with the title of Länssjågmästare or County Forester and a number of County woodwards and Overseers. The Forestry Boards were given, each one within its district, a remarkably independent position, and were thus able to adapt their activity to the conditions prevailing within that district. They became not only the guardians of the Forestry Act and a controlling organ, but were furthermore given authority to carry on advisory, instructive and supporting work in respect of everything appertaining to the care and management of forests. Subsequently, Forestry Legislation has been amended and completed in various respects. The Forest Conservation Law of 1923 and now in force, only allows cutting in younger forests in the form of thinning in such way that the development of the forest is promoted. Besides that the Forestry Boards have been granted powers to prevent felling of timber for sale on such a scale that the estate in future may suffer from a shortage of timber for home requirements.

"The General Forestry Act in conjunction with the Forestry Boards and 'at the same time the firm and elastic manner in applying the same, as well as their zealous work of instruction' has been of remarkable importance to the improvement of forestry, particularly in the smaller tenement forests, and one can now see farm-forests, which in such respect are on a very high level of excellence."

Young forest officers in Sweden receive four years' training, partly in the forest and partly in the College of Forestry in Stockholm. One department of this College has its summer headquarters for practical training in the forest of Malingsbo, and this was visited during the tour. The College of Forestry in Stockholm is a fine building and it appears to be very well equipped for teaching purposes.

Including British Colonies, the International Congress of Forestry Research Stations was attended by representatives of 31 countries. The Director of Kew also attended, unofficially, the Congress and the excursions. A very wide range of subjects was brought forward for discussion and the languages used were English, French and German. All the arrangements were in the hands of The Swedish Institute of Experimental Forestry, with Professor Hesselman as President, and Jägmästare Sven Petrini as Secretary. The organisation was excellent in every way. From commencement to finish everything was carried out according to time-table. This was no light work considering the large number of delegates, the wide extent of country covered, and the language difficulties. The various members of the Swedish Committee were courteous to all and did their utmost to make everyone comfortable and the Congress a success. At the same time private estate owners, companies, and municipal bodies assisted very materially towards the success of the tours and were most generous in their entertainment of the delegates.

## LI.—MISCELLANEOUS NOTES.

The following appointments at the Royal Botanic Gardens, Kew, have been made by the Minister of Agriculture and Fisheries :—MR. F. BALLARD, B.Sc., to be an Assistant (Herbarium) in succession to Mr. C. H. Wright (*K.B.* 1929, p. 139, p. 265); MR. C. E. HUBBARD (*K.B.* 1929, p. 139) to be a Temporary Assistant, and MR. A. A. BULLOCK, B.Sc., to be a Temporary Sub-Assistant in the Herbarium.

MR. ARTHUR BENNETT died on May 2nd, 1929, at Croydon, where he was born on June the 9th, 1844, and had spent the whole of his life. Although engaged in business, he devoted his spare time to the study of botany (both in the field and in herbaria) and became an authority on aquatic plants (especially Potamogetons) and Cyperaceae. His earliest publication was "On *Potamogeton lanceolatus*" in the *Journal of Botany*, 1881, p. 65. He was so prolific a writer that in the Royal Society's Catalogue covering the period from 1884 to 1900 the titles of his publications occupy four columns. He contributed the accounts of *Naiadaceae* to the *Flora Capensis* in 1897, and to the *Flora of Tropical Africa* in 1901. His critical knowledge of the plants he specially studied led to his receiving correspondence from botanists all over the world, and he was noted for the promptness with which he answered these enquiries. His disposition, in spite of many private troubles, was genial and unassuming, and he was ever ready to place his knowledge at the disposal of others, as the writer has experienced during Bennett's many visits to Kew.

His herbarium (except the Potamogetons) was purchased in 1906 by Mr. C. B. Clarke, who generously presented it to Kew, and at

Mr. Bennett's desire his British Potamogetons were sent after his death to the British Museum, and his exotic ones, with many critical notes, to Kew.

Arthur Bennett was elected a Fellow of the Linnean Society in March, 1881, and for many years was a most regular attendant at its meetings, but, when the illness of his brother and partner in business made increased calls on his time, he resigned in 1905, but was elected an Associate in December, 1910.

He was buried in the Mitcham Road Cemetery, Croydon.

C. H. W.

PROFESSOR DR. HANS SCHINZ has retired from the post of Director of the Botanical Museum of the University of Zürich. For upwards of forty years Professor Schinz has been in correspondence with Kew and during this long period has made many valuable contributions to the Herbarium, Library, and Gardens. In his earliest letters, written in the year following his travels in South-West Africa in 1884-87, he sought the co-operation of the Kew staff in naming the botanical specimens he had collected. A large number of these were afterwards presented. Altogether he has enriched the Herbarium with some thousands of specimens, obtained chiefly from South-west and other parts of Africa. He has always been willing to lend material required in the preparation of the African floras and in the revision of various genera. Professor Schinz made it a rule to send to Kew all his own botanical publications. A reference to the Library Catalogue shows that these have been numerous and important. In addition he has sent all the studies of his pupils and others which have been issued as "*Mitteilungen aus dem Botanischen Museum der Universität Zürich.*" Of these *Mitteilungen*, which are reprints from various periodicals or in many cases independent works, 132 have now been published. They include many elaborate treatises, amongst them being the late Dr. Thellung's "*Die Gattung Lepidium*" (1906), and "*La flore adventice de Montpellier*" (1912). One of the latest presentations to the Library by Professor Schinz is a copy of the *Festschrift* published last December on the occasion of the 70th anniversary of his birth. He is succeeded by PROFESSOR DR. A. V. DÄNIKER.

**Forests and Climate\*.**—Mr. Nicholson, who is Forest Adviser to the Governments of Kenya and Uganda, and who has had considerable experience of Forestry in India, here sets out the results of his observations on the relation of forests and rainfall in that part of East Africa in which he has recently worked. His treatment of the subject is, for the greater part of the publication, a criticism of the

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\*The Influence of Forests on Climate and Water Supply in Kenya, by J. W. Nicholson, with a Foreword by A. Walter. Forest Department Pamphlet No. 2. Colony and Protectorate of Kenya. The East African Standard Ltd., Nairobi, 1929, pp. 40

latest pronouncements of the meteorological experts on the subject, and in the main he is not inclined to endorse their findings. His objections are that they are too generalised, and that they attempt to treat a greatly diversified subject in too summary a manner. His criticisms based on his own observations in the field, lead him to the conclusion that forests exert a far greater effect on rainfall than meteorologists are inclined to admit. It is, in fact, another case of the field worker contrasting his experience with the deductions of the expert working from statistics in the office. The instances Mr. Nicholson quotes from Uganda and Kenya lend support to the general conclusions at which he arrives, but which he states he only advances on behalf of East Africa.

Briefly these conclusions are, that changes in the covering of vegetation may enormously affect the total rainfall ; that trees and deep-rooted shrubs contribute more moisture to the air than herbaceous vegetation or bare soil ; that the mountain forests of East Africa can induce occult precipitation up to at least 25 per cent. of the total annual rainfall ; that forests have little influence on cyclonic rain ; that the local effect of forests on monsoon rainfall is up to 3 per cent. but the regional effect may be greater ; that instability rain is greatly increased by the presence of forests.

The general and local effects of forests and stream flow, and the value of windbreaks, are discussed in the concluding chapters.

Mr. A. Walter, who has been appointed Director of the new British East African Meteorological Service, contributes a Foreword, in which he emphasises the importance of the study of forests in their relation to climate.

This pamphlet reopens a question which appeared to have been settled at a discussion before a recent meeting of the British Association, and in a recent paper before the Royal Meteorological Society. It would seem that the subject will receive considerable further attention now that more observations will be able to be carried out in equatorial regions.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1929 ROYAL BOTANIC GARDENS, KEW

## LII.—INDEX LONDINENSIS TO ILLUSTRATIONS OF FLOWERING PLANTS, FERNS AND FERN-ALLIES.

In 1855 Dr. G. A. Pritzel, who was keeper of the Royal Library at Berlin, brought out his well-known work, the "*Iconum Botanicarum Index Locupletissimus*," being what was then regarded as an exhaustive register of all known illustrations of Phanerogams and Vascular Cryptogams, chiefly from the time of Linnaeus onwards.

The botanical and horticultural worlds are this year able to welcome (what has been long overdue) the publication of the first volume of an emended and enlarged edition of Pritzel's work, under the title of "*Index Londinensis to Illustrations of Flowering Plants, Ferns and Fern-Allies*." The editor of this important work is Dr. Otto Stapf, F.R.S.

About 20 years ago the necessity of preparing a new edition of "Pritzel" became not only obvious, but urgent. The Council of the Royal Horticultural Society and Sir David Prain, the then Director of the Royal Botanic Gardens, Kew, made an unsuccessful appeal for the necessary funds. However, in 1912 the sum of £250, from the profits of the International Horticultural Exhibition at Chelsea, formed the nucleus of a fund which made possible the commencement of the work. About the year 1917 the Royal Horticultural Society began the task of organising the great undertaking which a revision of "Pritzel" would naturally entail, and guaranteed the cost of the compilation; at the same time the Society received grateful help from contributors interested in the work. Two Committees were constituted to draw up a code of recommendations, as a result of which an Honorary Editor was appointed, and the work was started in July 1918 at the Kew Herbarium and Library, where the Director granted the use of a room and placed the resources of the library at the disposal of the staff.

By the summer of 1927 a prospectus and proof-page of the new Index were issued. At the same time negotiations were carried on with the Delegates of the Clarendon Press, Oxford, for the printing of the work. In the summer of 1928 the card MS. of the first volume, comprising nearly 84,000 references to illustrations in various books and periodicals from all over the world, was in the hands of the printers. When the remaining five volumes are published the total number of entries will amount to nearly half a million.

As there were about 107,000 references in Pritzel's old Index, the additional 380,000 consist of those which were omitted by him and, in addition, the references to the pictorial literature published since 1865, the date of issue of the supplement to "Pritzel." This will give some idea of the very extensive scope of the work. The references are from all publications of post-Linnean date, i.e., from the year 1753, and extend as far as the year 1920 inclusive.<sup>1</sup> Owing, however, to the high quality of the pictures in certain books of pre-Linnean date, such as Rumphius' "Herbarium Amboinense" (1741) and Rheede's "Hortus Malabaricus" (1686), these have been taken up, but not without the aid of certain modern commentaries on those works.

The citations in the new Index are of illustrations of Phanerogams, Ferns and Fern-allies, the lower Cryptogams being excluded. They represent "portraits" of plants showing the habit and of detached portions of a plant, and of such details as help to indicate the morphology of the various parts. But anatomical structures and fossil plants are excluded. Although pictures of teratological forms ("sports" and "monstrosities") are not, as a rule, admitted, they nevertheless very frequently occur, as no sharp line can possibly be drawn between normal and abnormal structures.

No distinction is made between illustrations of species, subspecies, varieties or hybrids, so long as they are accompanied by scientific names, figures having only a generic name are not indexed. Not more than four names (including the generic one) are used, e.g., *Acer pseudoplatanus quinquelobum clausum*. The spelling of plant-names is in accord with the Latin as taught in modern schools, but *uniformity* is sought throughout, e.g., of the two forms "*ceylanica*" and "*zeylanica*," the former is always used, but the latter is given in a cross-reference. The authors of plant names have been quoted throughout, but absolute exactitude in all cases cannot be guaranteed, especially as regards the authors of varietal names. Certain symbols are used, e.g., an \* to denote a picture wholly or in part coloured, an ! to signify a "sport," and a x for a hybrid. The sequence is alphabetical for the generic and specific names and the minor grades, but is chronological for the references. In the matter of cross-references, it should be said in the first place that, as regards species, the names under illustrations are simply registered as they are found, no attempt being made to correct inaccuracies when such occur, except when they are obviously due to inadvertent slips.

When, however, as sometimes happens, these names are at variance with those which occur in the text, this fact is mentioned in the reference, and cross-references are introduced under the respective quotations. As regards *genera*, species are often put under generic names with which they have long ceased to be connected; a system of cross-referencing has therefore been devised

<sup>1</sup> For example, there are 153 references to illustrations of the Common Daisy.

based on Dalla Torre and Harms' "Genera Siphonogamarum" (1900-07), or, where this is out of date, on modern monographs or on the Editor's personal knowledge.

The Preface, by the President of the Royal Horticultural Society, is in English and Latin. The Editor's Introduction, giving a brief sketch of Pritzel's life and an account of the scope of the whole work, is in English only. The Key to the use of the Index, on account of its great importance, has been printed in English, French and German. This is followed by a list of subscribers.

Volume I consists of 547 quarto pages and contains references to illustrations from *Aa* to *Campanopsis*, the letter C being thus split up between Volumes I and II. Five more volumes will appear in due course. The price of the work is £5 5s. per volume.

No one who has not been actually engaged in the task can adequately realise the enormous amount of work and thought which the production of the MS. of the Index entails. The Delegates to the Clarendon Press are to be congratulated on the admirable way in which it is being printed. While the Index may hardly be as useful to gardeners as would seem to have been at first surmised by its promoters, it will be of immense value to the editors of Horticultural journals, to Universities, and in Botanical libraries throughout the world.

If, henceforward, the student in botany or horticulture finds the task of turning up pictures of any particular plant or plants much more easy than he ever did before, it will be due to the facilities provided by the "Index Londinensis," thanks to the wisdom and generosity of the Royal Horticultural Society.

W. C. W.

### LIII.—SOME INTERESTING ERIAS FROM BURMA.

V. S. SUMMERHAYES.

**Eria decipiens** *Summerhayes*, sp. nov.—*E. extinctoria* Oliver, Bot. Mag., t. 5910 (1871), quoad ic. et desc. tantum, non *Dendrobium extincitorium* Lindl.

A comparison of a flower from the type specimen of Lindley's *Dendrobium extincitorium* with the plant figured in Bot. Mag. t. 5910 under the name *Eria extinctoria* Oliver, based on *D. extincitorium* Lindl., shows that another species has been figured by mistake. There are two main features in which the two differ. Firstly, the drawing (unfortunately there are no specimens preserved) shows the dorsal sepal to be constantly 8 mm. long, while it is stated in the description that the flowers are from one-half to two-thirds of an inch long. The type of *D. extincitorium* Lindl. (consequently also of *E. extinctoria* Oliver, as to combination only) has the dorsal sepal only 4 mm. long, and this is also the case with other undoubted specimens of *E. extinctoria* in the Kew collections. The flowers also are just under half an inch in length. Secondly, the two plants differ in the shape of the lip, *E. extinctoria* having the middle lobe



short and broad and overlapping the side lobes, which are relatively large. The plant in Bot. Mag. t. 5910 has a middle lobe with each lobule larger than the side lobe and not at all overlapping. It also has three prominent lines of hairs on the disc whereas in *E. extinctoria* these are hardly distinguishable.

I have therefore restricted the name *Eria extinctoria* to the species first described as *Dendrobium extinciorium* by Lindley, and separate the Bot. Mag. plant as a distinct species under the name *E. decipiens* in allusion to the deceptive resemblance it bears to the other species.

Two other species belonging to this group of *Eria* have been discovered in the same part of Burma and are represented in the Kew Herbarium. Both come from the Dawna Hills at considerable altitudes, and there seems no doubt that this is the centre of distribution of this very interesting group of small epiphytes.

***Eria Lacei* Summerhayes**, sp. nov. ; affinis *E. decipienti* Summerhayes, sed caulibus bifloris, labelli lobo intermedio integro angustiore satis distincta.

*Planta* humilis, epiphytica, aphylla ; pseudobulbi aggregati, subglobosi, apice depressi, siccitate valde et acute plicati, 5–10 mm. diametro. *Scapus* terminalis, saepius biflorus, usque 5 cm. altus, gracilis, glaber, inferne cataphyllo singulo vaginante acuto instructus ; bractee ovatae, acutae, membranaceae, 2–3 mm. longae ; pedicelli cum ovario 9–13 mm. longi. *Sepalum* dorsale lanceolatum, subacutum, 7–8 mm. longum, 2.5 mm. latum, concavum ; sepala lateralialia oblique triangularia, acuta, latere brevius 8–9 mm. longa ; mentum 4–5 mm. longum. *Petala* oblonga, obtusa, 6–7 mm. longa, 2.5 mm. lata ; sepala et petala omnia quinquenervia. *Labellum* ex ungue brevi sensim dilatatum, superne trilobum ; lobi laterales breves, rotundati ; lobus intermedius fere orbicularis, antice paulo crenulatus, 3.5–4.5 mm. longus, 4–5 mm. latus ; labellum 10–12 mm. longum, 6.5 mm. latum, disco lineis tribus pilorum instructo. *Columna* brevissima, compressa.

Amherst District. Near Lampa Chaung, Dawna Range, 3500 ft., March, 1909, *Lace* 4751.

***Eria conica* Summerhayes**, sp. nov. ; affinis *E. extinctoriae* Oliver a qua scapo 1–4-floro, floribus majoribus, labello longiore lobo intermedio triangulari apiculato differt.

*Planta* nana, epiphytica, aphylla ; pseudobulbi (e tabula photographica solum cogniti) iis *E. extinctoriae* similes, brunnei. *Scapus* laxe 1–4-florus, strictus, usque 5 cm. altus, gracilis, teres, glaber, inferne cataphyllo singulo acuto basi vaginante instructus ; bractee ovatae, acutae, 2–3 mm. longae, infima saepius basi vaginante. *Flores* horizontales ; pedicelli suberecti, cum ovario 1.3–2 cm. longi. *Sepalum* dorsale lanceolatum, subacutum, 6–7 mm. longum, 2.5–3 mm. latum ; sepala lateralialia oblique triangularia, acuta, latere brevius 7 mm. longa, mentum strictum subconicum obtusum

7 mm. longum formantia. *Petala* elliptico-ovata, acuta, 6 mm. longa, 3.5 mm. lata. *Labellum* basi cuneatum, apice trilobum, 14–15 mm. longum, 6.5 mm. latum; lobi laterales brevissimi, rotundati; lobus intermedius anguste triangularis, apice apiculatus, carnosus, 3.5 mm. longus, basi 2.5 mm. latus, calvus. *Columna* brevissima, antice valde concava; anthera cylindrico-conica.

Amherst District. Misty Hollow, Dawna Hills, 2400 ft., Feb., 1927, *Parkinson* 5288. "Flowers white with faint pink stripes running down the perianth segments."

This species is remarkable for the several-flowered scapes and long conical mentum. In general vegetative characters it agrees well with the other species already mentioned.

#### LIV.—THE AUSTRALIAN SPECIES OF *Lonchocarpus* AND *Derris*. C. T. WHITE.

I recently received an enquiry from the Australian Council for Scientific and Industrial Research regarding the occurrence in Australia of plants of the genera *Derris*, *Tephrosia* and *Lonchocarpus* respectively. On looking up the literature and specimens at my disposal I found that there had been some confusion regarding the species of *Derris* and *Lonchocarpus*, and a summary of the Australian species is therefore offered herewith.

A peculiar case is that of *Lonchocarpus nesiotes*: this was named by F. M. Bailey in 1906 from two distinct specimens—one from Percy Islands (Tryon and Young) and one from the Bloomfield River (W. Poland). The latter specimens were afterwards placed by Domin (1926) under *Derris*. Both specimens are rather fragmentary but the Percy Island one is, I think, referable to the common *L. Blackii* Benth. The Bloomfield River ones were evidently collected from two distinct plants, the leaves and flowers representing *Lonchocarpus Blackii* Benth., and the pods a species of *Derris*, most likely *D. trifoliata* Lour. var. *macrocarpa* Domin.

*Lonchocarpus H. B. et K.*

***Lonchocarpus Blackii*** F. Muell. Fragm. Phytogr. Austr. ii. 123 (1861). *Lonchocarpus nesiotes* F. M. Bailey in Queensl. Agric. Journ. xvii. 162 (1906), in part.

Endemic in Australia. Common in north-eastern New South Wales and along nearly the whole coast of Queensland as far north as the Bloomfield River (lat. 16° S.).

*Derris Lour.*

1. ***Derris involuta*** *Sprague* in Gard. Chron. ser. 3. xxxviii. 3 (1905), and in Kew Bull. 1914, 230. *Derris scandens* auct. plurim. austral., vix *Dalbergia scandens* Roxb. *Wistaria involuta* *Sprague* in Gard. Chron. ser. 3. xxxvi. 141 (1904). *Derris oligosperma* W. G. Craib in Bot. Mag. t. 8530 (1913), non K. Schum. et Lauterb.

Endemic in Australia ; common in north-eastern New South Wales and south-eastern Queensland. Our northernmost record in a big series of specimens is Kin Kin, Wide Bay district, about 26° 30' S. lat.

Domin (Beitr. Fl. & Pflanzengeog. Austral. in Bibliotheca Botanica, 89, iii. 1926) records *D. scandens* from Tambourine Mountain, and speaks of it as fairly common in southern Queensland and northern New South Wales. I have not seen his specimens but should say they were undoubtedly referable to *D. involuta* Sprague. He records *D. involuta* Sprague from Cairns (about 17° S. lat.) but what these are I cannot say.

2. **Derris trifoliata** Lour. Fl. Cochinch. 433 (1790), var. **macrocarpa** Domin in Bibliotheca Botanica, 89, iii. 786 (1926). *D. uliginosa* auct. plurim. austral., non Benth. *Lonchocarpus nesioties* F. M. Bailey in Queensl. Agric. Journ. xvii. 162 (1906), in part.

Widely spread over the tropics of the Eastern Hemisphere. It is very common in north-eastern Queensland from Mackay (about 21° S. lat.) northwards. All our specimens in fruit bear oblong, usually 2-seeded pods, so it is possible that all the Queensland plants represent Domin's variety.

3. **Derris koolgibberah** F. M. Bailey in Rept. Govt. Sci. Exped. Bellenden-Ker, 38 (1889).

Endemic in Queensland ; so far as known, restricted to the country between the Mulgrave River and Cairns (about 17° S. lat.).

## LV.—CONTRIBUTIONS TO THE FLORA OF BURMA : VIII\*. C. E. C. FISCHER.

**Mitrephora lophophora** C. E. C. Fischer [Anonaceae] ; *M. Maingayi* Hook. f. & T. affinis, foliis acuminatis nervis supra haud impressis, petalis externis elliptico-oblongis acutis marginibus integris, ovario 6-ovulato, stylis longis differt.

*Tree* ; stem grey ; branchlets brown, furrowed, glabrous, dotted with small, round or elliptic lenticels ; youngest twigs fulvous-tomentose. *Leaves* chartaceous, elliptic to elliptic-lanceolate, apex bluntly acuminate, base narrowed, 7–13 cm. long, 2.25–5 cm. wide, glabrous and shining above, initially densely fulvous-silky-tomentose below becoming quite glabrous but minutely scaly, midrib and 6–8 pairs of arched primary nerves prominent below ; petioles shallowly channelled above, dark, transversely rugulose, 5–11 mm. long. *Inflorescence* of few-flowered (only 1 expanding at a time) racemes terminating short lateral shoots ; peduncles and pedicels densely rufous-tomentose ; pedicels 1–1.5 cm. long, bearing a median or submedian broadly ovate, semiamplexicaul bract, glabrous above, densely rufous-tomentose below. *Sepals* very shortly united at the base, hemispheric, apex bluntly apiculate, 5 mm. long, glabrous

\*Continued from *K.B.* 1929, p. 207.

within, densely rufous-tomentose without. *Outer petals* broadly oblong-elliptic, acute, 2.2–2.4 cm. long, 1.3–1.5 cm. wide, rather densely grey or rufous-hairy without, sparsely grey-hairy or glabrous within, many-veined; inner petals 1.5–1.6 cm. long, blade broadly cordate, subacute with a ligulate claw as long, claw and blade without pubescence, blade within bearing a dense brush of matted mole-coloured (when dry) hairs. *Stamens* numerous, 1 mm. long. *Ovaries* about 20, 1 mm. long, compressed ellipsoid, setose; ovules 6 in 2 rows; style oblong or subclavate, slightly compressed, as long as the ovary, glabrous. *Fruit* not seen.

Mergui, 10 miles from Victoria Point, 1050 ft., flowers March, *Sukoe* per C. E. Parkinson 7701, "Flowers light yellowish with a pinkish line."

***Polyalthia lateriflora* King** [Anonaceae].

Known from the Malay Peninsula.

Mergui, Baukachon, 900 ft., flowers Dec., *Sukoe* per C. E. Parkinson 6233, "Tree; flowers greenish; stem grey, terete."

***Viola biflora* Linn. var. *acuminata* Maxim.** [Violaceae].

Namkin Mountains, Seingkhu Wang, 7000 ft., flowers May, *Kingdon Ward* 6770, "Flowers bright yellow, lower petal darkly herring-boned with black-purple, a few lines on the other petals also. In alder copse in the stony river-bed."

***Viola moupinensis* Franch.** [Violaceae].

Known from China and Assam.

Namkin Mountains, Seingkhu Wang, 10000 ft., flowers June, *Kingdon Ward* 6847, "Flowers violet. On stony moraine-like earth banks on the sides of the glen."

***Viola sikkimensis* W. Becker** [Violaceae].

Known from Sikkim, Assam, China and Sumatra.

Namkin Mountains, Seingkhu Wang, 5000 ft., flowers May, *Kingdon Ward* 6726, "Flowers white, more or less streaked with violet. On shaded banks in forest."

***Viola Thomsoni* Oudem.** [Violaceae].

Known from Sikkim.

Namkin Mountains, Nogmung, 2000–4000 ft., April, *Kingdon Ward* 6650, 6669, "Flowers pure white with a few purple guide lines. In colonies on shaded earth banks."

***Glycosmis Wintii* Craib** [Rutaceae].

Known from Siam.

Mergui, Tenasserim River, R. N. Parker 2461, "Small tree, bark nearly smooth, a thin corky layer and then bright green inner bark with light brown streaks, leaflets 6–8."

***Barringtonia Kermodel* C. E. C. Fischer** [Lecythidaceae]; *B. acutangulae* Gaertn. affinis, pedicellis floribusque majoribus, receptaculo quadrangulato, ovario 3-loculari differt.

*Tree*, 20–30 ft. high ; twigs thick, greyish-brown, furrowed when dry, glabrous ; innovations puberulous. *Leaves* subcoriaceous, obovate, apex rounded, base gradually attenuate, 13–17 cm. long, 3–8.5 cm. wide, quite glabrous, midrib thick, prominent below, primary nerves 6–8 pairs, raised below, regular, arched and anastomosing near the margin, usually running upwards parallel with the midrib for 2–5 mm. and then bent abruptly outwards, ultimate reticulations fine and distinct on both surfaces, margins entire near the base elsewhere denticulate-crenate, petioles short, channelled above. *Inflorescence* in racemes up to 40 cm. long from the extremities of the old twigs ; rhachis angled when dry, flowers numerous, about 1 cm. long ; pedicels thickened upwards, 0.6–1 cm. long ; bracts deciduous (not seen). *Receptacle* funnel-shaped, quadrangular in section, 5 mm. long. *Calyx* tube very short, lobes 4, broadly triangular, rounded, unequal, 2–2.5 mm. long, minutely ciliate. *Petals* 4, suborbicular from a broad base, concave, 6–7 mm. long. *Stamens* very many ; filaments filiform, longer than the petals, united below to form a short ring. *Ovary* enclosed in the receptacle, crown flat, 3-celled ; ovules 2 in each cell, pendulous ; style terete, as long as the petals. *Fruit* not seen.

Bassein District, near Bawmi, sea-level, Feb., C. W. D. Kermodé 7190, “ flowers dark-red.” Vernacular name : *Kye*.

**Anplectrum barbatum** Triana ex C. B. Clarke (Melastomataceae).

The species was so named by “ Triana in Trans. Linn. Soc. xxviii. 84 based on sheet No. 4082 of the Wallich Collection, named *Melastoma barbatum*.” As no description accompanied the citation, the first valid publication was that of C. B. Clarke in the Fl. Br. India ii. 546, where it was placed under the doubtful species. The Wallichian specimens, which were collected on Chappedong Hill in Martaban on 23. ii. 1827, consist of twigs with a few leaves but present neither inflorescence, flowers nor fruit and no other specimens have been attributed to the species since then until Professor W. G. Craib pointed out that certain recent Siamese and Burmese collections allocated to *A. glaucum* Triana, a Penang plant, were probably this species. This led to the examination of all the Burmese specimens in Kew Herbarium, and to the conclusion that at present *A. glaucum* Triana is not represented from Burma at all. The fact that the specimens hitherto accredited to the last-named species, including those cited by C. B. Clarke (Fl. Br. Ind. ii. 545), are really *A. barbatum* Triana is not left in doubt owing to the presence of the peculiar stellate-puberulous bristles on the upper side of the petioles and the abruptly acuminate leaves. *A. cyanocarpa* Kurz (non Triana) Journ. As. Soc. Beng. xlvii. 78 and For. Fl. Br. Burm. i. 508, is also this species. The two species differ by the following characters :—

*A. glaucum* : *Leaves* gradually acuminate, base shallowly cordate. *Petioles* with slender, naked bristles above. *Buds* acutely acuminate.

*Petals* lanceolate, caudate-acuminate. *Staminodes* at most 2, connective erect, subtrilobed, margins irregularly dentate, devoid of processes.

*A. barbatum*: *Leaves* abruptly acuminate, base rounded or subtruncate. *Petioles* with thick, stellate-pubescent bristles above. *Buds* blunt or subacute, not at all acuminate. *Petals* ovate, subacute. *Staminodes* 4, connective descending, triangular, apex bifid, margins entire, with 2 slender, vertical horns.

In view of the meagre description, lacking all mention of inflorescence or fruit, an amplified one is appended, based on all the specimens quoted below.

A climbing or twining *shrub*; branches terete, glabrous, often hollow, often bearing aerial roots, nodes more or less swollen and with a stipular ridge; youngest twigs solid, minutely stellate-puberulous, more densely so at the nodes. *Leaves* chartaceous, ovate to elliptic-lanceolate, apex bluntly rather abruptly acuminate, base in the broadest leaves subtruncate, the narrowest somewhat narrowed to the rounded base, 7–17 cm. long, 2.5–8 cm. wide, 3-ribbed from the base with a more slender nerve on either side close to the entire margin, the 2 lateral ribs continuous to the apex, the ribs and sometimes the marginal nerves slightly impressed above and prominent below, secondary nerves transverse, regular, parallel, nearly horizontal, with finely reticulate veins between, both surfaces of the blade minutely stellate-puberulous, ultimately glabrous; petioles 0.7–1.5 cm. long, minutely furfuraceously stellate-puberulous, usually with a brush of furfuraceously whitish stellate-puberulous bristles on the upper side. *Panicles* lax, terminal and in the upper axils, up to 12 cm. long, rhachis and its branches minutely rusty or whitish stellate-puberulous, ultimate divisions 3-flowered, the central flower with an inarticulate pedicel 5–6 mm. long, the lateral with much shorter pedicel articulated near the base; bracts caducous (not seen); bracteoles 2, opposite, ligulate, rounded, 3 mm. long, minutely stellate-puberulous on both faces, margins ciliate with long and very short stellate-puberulous setae. *Buds* ellipsoid, blunt or subacute, not acuminate. *Calyx* urceolate, 6 mm. long, minutely rusty stellate-puberulous becoming almost glabrous in fruit, mouth truncate, margin slightly widened. *Disk* lining the calyx to within 5 mm. of the mouth, thickened at 4 equal intervals to seat the petals and stamens. *Petals* 4, ovate, subacute, inequilateral, 8–9 mm. long, glabrous, mauve or violet. *Stamens* 8, alternately perfect and imperfect, the latter very rarely reduced to 2, all inflexed in bud with the anthers lodged in cavities between the disk and the ovary, quite glabrous; filaments fleshy, ligulate, up to 4 mm. long, those of the imperfect ones smaller, perfect anthers sigmoidally curved, 1–1.1 cm. long, the beak about equalling the cells, connective produced at the base into a triangular dorsal and a bifid ventral appendage; anthers of imperfect stamens empty, subulate,

slender, 4–5 mm. long, curled at the apex, appendaged at the base with a descending triangular bilobed membrane and 2 slender erect horns. *Ovary* enclosed in the calyx, 3–4 mm. long, connected with the disk by 4 vertical septa forming 4 cavities to receive the anthers before expansion, 4-celled, crown slightly domed; style linear, flattened, 1.7 cm. long, curved to bring the stigma to one side. *Fruit* subglobose, filling the persistent calyx, 7 mm. long.

Martaban, Chappedong Hill, *Wallich* 4082; Tenasserim, *Helper* Kew Distribution No. 2290; Mergui, *Griffith* Kew Distribution No. 2289; S. Tenasserim, Kallinkwan chaung, 200 ft., flowers and fruit Feb., *C. E. Parkinson* 1691; banks of Tenasserim River, sea-level, Feb., *C. E. Parkinson* 1953.

***Randia uranthera*** *C. E. C. Fischer* [Rubiaceae]; *R. sootapensi* Craib affinis, foliis majoribus, floribus majoribus, antheris longioribus caudatis differt.

*Tree* 20 ft. high; “stem dark grey.” *Leaves* coriaceous, linear-to elliptic-lanceolate, long-acuminate, base acute, 13–18 cm. long, 2.75–5.75 cm. wide, quite glabrous, midrib raised above, prominent below, primary nerves 5–7 pairs, arched, slightly raised on both surfaces; petioles rather stout, 0.6–1 cm. long; stipules triangular, acute, 3 mm. long, early deciduous. *Flowers* in fascicles in the upper axils, sessile in pairs; peduncles very short, glabrous or appressed hairy; bracteoles 2, opposite, broadly ovate, acute, appressed hairy and ciliate. *Receptacle* terete, 0.9–1 cm. long, 3 mm. diam., appressed hairy. *Calyx* shortly appressed hairy without, densely clothed with longer appressed stiff rufous hairs within, tube 4–5 mm. long, lobes 5, triangular, cuspidate, 2.5 mm. long. *Corolla* glabrous; tube striate without when dry, 6–7 cm. long, about 2 mm. diam. at base, very gradually widened upwards to near the apex and then abruptly funnel-shaped and over 1 cm. diam. at the mouth; lobes 5, oblong, obtuse or subacute, up to 2.5 cm. long and 1.5 cm. wide. *Stamens* 5, in the mouth of the corolla and partly exserted; anthers linear, apex obtuse with the connective shortly excurrent, gradually narrowed downwards into pointed tail, 2.3 cm. long, attached at the centre by a very short filiform filament. *Ovary* enclosed in the receptacle, crown flat; style filiform expanding into a spindle-shaped stigma 1.2 cm. long half of which is exserted from the corolla. *Fruit* not seen.

Tavoy, Ba Wa Reserve, Feb., *Ba Pe* per *C. E. Parkinson* 8108, “Flowers white,” apparently fragrant.

var. **minor** *C. E. C. Fischer*.

Differs from the type as follows: *Leaves* elliptic, 16–24 cm. long, 3.75–7.25 cm. wide; stipules broadly triangular. *Receptacle* 0.6 cm. long. *Corolla* tube 3–3.5 cm. long; lobes broadly ovate or suborbicular, obtuse, 1.6 cm. long, 1.2–1.4 cm. wide. *Stamens* 1.2 cm. long, not so distinctly tailed.

Mergui. Tenasserim Range, 250 ft., Feb., *Sukoe* per *C. E. Parkinson* 7627, “Flowers white, outside pinkish, fragrant.”

**Symplocos Sukoei** C. E. C. Fischer [Symplocaceae]; *S. Maingayi* Benth. affinis, ramulis et inflorescentia cinereo-puberulis, foliis majoribus, corollis maturis externe fere glabris, tubo staminali longiore differt.

"Tree 70 ft. high; stem grey with white patches"; branchlets terete, shallowly sulcate, minutely grey-puberulous upwards, youngest twigs rather densely ashy-puberulous. *Leaves* chartaceous elliptic-oblong or -obovate, apex acute or obtuse, base narrowed, slightly inequilateral, 13-19 cm. long, 5-8 cm. wide, midrib and 6-7 pairs of arched primary nerves, which anastomose well within the entire margin, slightly impressed above, prominent below, glabrous on both sides except the minutely puberulous midrib and primary nerves beneath; petioles shallowly channelled above, pubescent, 5-8 mm. long. *Inflorescence* in axillary few-flowered cymes; rhachis shallowly furrowed when dry, up to 2 cm. long, fuscous- or ashy-felted; pedicels very short; bracteoles minute, ensiform, ashy-felted. *Receptacle* 3-4 mm. long, sulcate when dry, felted with ashy tomentum. *Calyx* fleshy, continuous with the receptacle, felted with ashy tomentum without, glabrous within; tube 2 mm. long; lobes 5, hemispheric, ashy-ciliate, 1 mm. long. *Corolla* fleshy, white (reddish-brown when dry), minutely puberulous on both surfaces except the inside of the lobes; tube cylindric, 2-2.2 cm. long, 1.5 mm. diameter; lobes 5, ligulate, apex rounded, channelled within, 1.5-1.75 cm. long. *Staminal tube* on the mouth of the corolla tube, cylindric, yellow, about 1 cm. long, mouth denticulate; anthers numerous on the inner face and the mouth of the tube, oblong, 1 mm. long, apiculate. *Ovary* inferior, sunk in the receptacle and very shortly protruded above it, the free part conical, densely ashy-hairy, 3-celled; ovules solitary in each cell, elongate, pendulous; style filiform, exserted 2.5 mm. beyond the staminal tube, diminishingly ashy-hairy from base upwards, the exserted portion minutely ashy-puberulous; stigma capitate. *Fruit* not seen.

Mergui, Maliwun, Nalechaung, 450 ft., flowers in April, *Sukoe* per C. E. Parkinson 7776. "Flowers sweet-scented."

**Alstonia rostrata** C. E. C. Fischer [Apocynaceae]; *A. angustilobae* Miq. affinis, foliis caudato-acuminatis subtus haud pallidis, lobis calycis et corollae suborbicularibus differt.

*Tree* up to 100 ft. high and 4 ft. girth; bark brownish, furrowed, soft; branchlets brown, glabrous; twigs in whorls of 3 or 4; sap milky. *Leaves* opposite or in whorls of 3-4, elliptic-oblong, apex rather abruptly obtusely caudate-acuminate, base cuneate and shortly decurrent, quite glabrous, shining above, 8-15 cm. long, 3-5 cm. wide, midrib raised below, primary nerves 30-50, nearly horizontal and straight to near the margin and there united by a sub-marginal vein, distinct above, very slightly raised below, margins slightly revolute and waved; petioles flattened, 1.5-3 cm. long. *Inflorescence* of whorled terminal or subterminal panicles shorter than the leaves; rhachis 2-8 cm. long, branches whorled 3-4 mm.



long, pedicels reddish, glabrous; bracts and bracteoles minute, narrowly ovate, acute. *Calyx* reddish, 2 mm. long, tube cup-shaped; lobes hemispheric, 0.5 mm. long, puberulous on both sides, margins whitish, minutely ciliate. *Corolla* hypocrateriform, white, fragrant, tube cylindric, 6 mm. long, glabrous except for minute pubescence near the top outside and a band of deflexed white hairs below the anthers within; lobes suborbicular over-lapping to the left, 4 mm. long, whitish-puberulous on both sides, densely white-hairy at the base within. *Stamens* inserted about the middle of the corolla tube, included; filaments very short, filiform, anthers linear-subulate, acuminate, base rounded, free from the stigma, 1.5 mm. long. *Ovary* 2 mm. long, 2-fid, united by the style; style filiform, 2 mm. long, oblong at the apex, stigmas 2, linear-lanceolate, apex reaching to about the middle of the anthers. *Follicles* narrowly subulate, terete, up to 20 cm. long and 1.25 cm. diam., apex blunt, valves woody, glabrous, when dry brown and longitudinally wrinkled without, whitish and smooth within. *Seeds* numerous, oblong, flattened, rounded at both ends or subtruncate at one end and shortly obtusely narrowed at the other, 1 cm. long, 3-4 mm. wide, rugulose and with a median longitudinal rib on each face, comose with brown silky hairs up to 2.2 cm. long at each end and for a short distance down the sides.

Thaton, Yatheytaung, 2500 ft., flowers March, *P. Chin* per C. E. Parkinson 6536 (type), vernacular name *Taung-ma-yo*; Mergui, Victoria Point, 75 ft., flowers Jan., *Sukoc* per C. E. Parkinson 6297; fruit March, *Sukoe* per C. E. Parkinson 7684 (type for fruit).

**Beaumontia (Amalocalyx) rosea** C. E. C. Fischer [Apocynaceae]; *B. shanicæ* MacGregor et Smith affinis, foliis latioribus paucinerviis, floribus minoribus, corollae lobis tubo brevioribus distincta.

*Climber*; bark fibrous; twigs softly tomentose; sap milky. *Leaves* broadly elliptic, sometimes broadest a little above the middle, apex abruptly shortly cuspidate, base acute, up to 25 cm. long and 15 cm. wide, when young silvery tomentose, later thinly pubescent above (more densely on the nerves), thinly tomentose below, midrib impressed above, prominent below, primary nerves 5-8 pairs, rather regular, anastomosing with a wide loop well within the slightly undulate margin; petioles channelled above, 2.5-3.5 cm. long, pubescent. *Cymes* many-flowered, shorter than the leaves; rhachis and its branches stout, brownish-tomentose; pedicels 1.5-2.5 cm. long, brownish-tomentose, bracteoles linear, 2.3 mm. long, tomentose, deciduous. *Sepals* nearly free, ovate-lanceolate, subacute, 1-1.4 cm. long, thinly fuscous-tomentose on both faces. *Corolla* widely campanulate from a short cylindric base, 3-4 cm. long, light pinkish, whitish-pubescent without, glabrous within except the lobes; cylindric base 5-7 mm. long, 2-3 mm. diam.; lobes 5, semicircular, subacute, 0.8-1.3 cm. long, with short rhomboid erose lobules between, shortly white-hairy within. *Disk* annular,

5-lobed, shorter than the ovary, glabrous, mouth white-ciliate. *Stamens* on the mouth of the cylindric base of the corolla, included; filaments about 1 cm. long, flat, basal half expanded, densely white-hairy, upper glabrous; anthers sagittate, dorsally white-hairy, finely acuminate, 8-9 mm. long including the finely subulate tails. *Ovary* cushion-shaped, 2 mm. long, densely white-hairy; style densely white-hairy; stigma oblong. *Fruit* not seen.

Mergui, Maliwun, Bausanpan, 50 ft., flowers April, *Sukoe* per C. E. Parkinson 7751. Vernacular name: *Mwai kyan* (Siamese).

***Dischidia lancifolia* Ridl.** (non Merr.) [Asclepiadaceae].

Known from Indo-China.

Mergui, Lenya Valley, flowers Feb., R. N. Parker 2712.

***Loranthus grandifrons* King** [Loranthaceae].

Known from the Malay Peninsula and Sumatra.

Mergui, Maliwun, 300 ft., flowers Dec., *Sukoe* per C. E. Parkinson 6251. Leaves up to 10.5 × 5 inches.

***Disporum acuminatum* C. H. Wright** [Liliaceae-Uvulariaceae]; *D. Leschenaultiano* D. Don affine, foliis oblongis longe acuminatis differt.

A large glabrous herb. *Leaves* oblong, long acuminate, papyraceous, 13-22 cm. long, 3-7 cm. wide; primary nerves about 3, secondary numerous; petioles 1 cm. long. *Raceme* terminal, few-flowered; pedicels 2 cm. long. *Perianth*-segments lanceolate, acuminate, 2.4 cm. long, 2 mm. broad at the base; basal appendage 5 mm. long, above rounded-cucullate. *Filaments* subulate, 2.2 cm. long; anthers dorsifixed, 6 mm. long. *Ovary* subglobose, loculi many-ovuled; style robust, cylindric, 7 mm. long, with 3 recurved branches 3 mm. long.

Myitkyina District, Nawraw chaung, Dec., C. E. Parkinson 1871.

This species is allied to *D. Leschenaultianum* D. Don, which differs in having broadly ovate leaves, not so long acuminate, and more primary nerves. The leaves of *D. acuminatum* are very thin and their nerves not very prominent; the plant is described by Mr. Parkinson as a "herbaceous undershrub."

## LVI.—NOTES ON BLASTUS COGNIAUXII AND TWO ALLIED SPECIES. G. H. SPARE.

When the Indo-Chinese specimens of *Blastus* (Melastomataceae) in the Herbarium were being examined recently, it was found that those named *B. Cogniauxii* were quite distinct from the Bornean plants so-named. This discovery led to a thorough examination of all the material under that name.

*Blastus Cogniauxii* Stapf was first published in Hooker's *Icones Plantarum* (1895, t. 2311), when it was transferred from the genus *Ochthocharis*. The plant was first described by Cogniaux in De Candolle's *Monographiae* (vii. p. 481) under the name *O. parviflora*,

and on its transference to *Blastus* a new specific epithet had to be found because a *B. parviflorus* Triana already existed. The true *B. Cogniauxii* has so far been found only in Borneo, the type being Beccari 1403, from Sarawak.

One of the Indo-Chinese sheets bears the manuscript name *Blastus eglandulosus* Stapf, which name, it appears, was never published. A full description is given below. The plant described by Guillaumin in H. Lecomte's Flore Gén. Indo-Chine (ii. p. 898) as *B. Cogniauxii* is *B. eglandulosus* Stapf. The type specimen of *B. eglandulosus* Stapf (*Balansa* 3517) is referred by Cogniaux in De Candolle's Monographiae to *B. cochinchinensis* Cogn., from which it differs considerably.

The *B. Cogniauxii* of King in the Journal of the Asiatic Society of Bengal (lxix. i. p. 13), and of Ridley in the Flora of the Malay Peninsula (i. p. 773), is also distinct and is described below as a new species under the name of *B. caudatus*. The three species concerned may be distinguished as follows :—

Leaves glandular :

Leaves caudate-acuminate, buds very acute, petals ovate, caudate-acuminate—Malay Peninsula.....*B. caudatus*.

Leaves acuminate, buds almost obtuse, petals ovate, acute—Borneo.....*B. Cogniauxii*.

Leaves not glandular, petals orbicular, caudate-acuminate—Indo-China.....*B. eglandulosus*.

***Blastus eglandulosus* Stapf** ms., sp. nov. ; a *B. Cogniauxii* Stapf foliis floribusque eglandulosis, antheris longioribus, stylo longiore, ovario oblongo, differt.

*Frutex* gracilis, ramosus, glaber, caulibus leviter striatis. *Folia* ovata, obtuse acuminata, basi subito angustata, usque ad 11 cm. longa et 4 cm. lata, tenuia, supra glabra vel glabrescentia subtus glabra vel nervis primariis parce pilosa, nervis primariis 5, intra-marginalibus tenuibus, margine vix denticulato vel undulato ; petioli 1-1.5 cm. longi, graciles glabrescentes. *Paniculae* axillares et terminales, graciles, glabrae, 2-3 cm. longae ; pedicelli 1-2 mm. longi ; bracteae nullae ; alabastra valde acuta. *Receptaculum* manifeste quadrangulare, glabrum. *Calycis* lobi parvi obtusi vix 1 mm. longi eglandulosi. *Petala* erecta orbiculata, caudato-acuminata, glabra, 1.5-2 mm. longa, alba (ex Eberhardt). *Stamina* 6 mm. longa ; filamenta eglandulosa ; antherae valde acutae eglandulosae, quam filamenta parum longiores. *Ovarium* oblongum ; stylus gracilis, 8 mm. longus. *Capsula* oblonga, glabra, 3 mm. longa.—*B. cochinchinensis* Cogn. in DC. Monog. Phanerog., vii p. 476 quoad pl. Balansae. *B. Cogniauxii* Guillaumin in Lecomte, Fl. Gén. Indo-Chine, ii. p. 898, non Stapf.

INDO-CHINA. Tonkin, Forests of Mount Bavi, 1000 m., *Balansa* 3517 (type) ; Annam, Phu Tho, *Eberhardt* 5070 ; Laos, Paklai, *Thorel* 3540 (type of fruit).

**Blastus caudatus** G. H. *Spare*, sp. nov. ; a *B. Cogniauxii* Stapf petalis acuminatis, antheris brevioribus acuminatis, alabastris acutis, foliis caudato-acuminatis differt.

*Frutex* gracilis, ramosus, caulibus teretibus levibusque, junioribus dense glanduloso-furfuraceis stramineis. *Folia* ovato-lanceolata, caudato-acuminata, basi acuta, 5–25 cm. longa, 1–6 cm. lata, tenuia, supra glabra vel pubescentia, subtus glandulis luteis vel croceis instructa, nervis primariis 5 dense glandulosis, intramarginalibus tenuibus, margine vix denticulato ; petioli 0.5–2 cm. longi, graciles, glandulosi. *Paniculae* axillares et terminales, graciles, glandulosae, 1.5–3 cm. longae ; pedunculi 1–5-flori ; pedicelli usque ad 1 mm. longi ; bractee ante anthesin deciduae ; alabastra valde acuta. *Receptaculum* leviter quadrangulare vel globosum, dense glandulosum. *Calycis* lobi parvi suborbiculares acute denticulati vix 1 mm. longi, glandulosi. *Petala* erecta, ovata, caudato-acuminata, glabra, marginibus membranacea, 1.5–2 mm. longa, lutea (ex Kunth et Ridley). *Stamina* 3 mm. longa ; filamenta glandulosa antheris subaequilonga ; antherae ovato-lanceolatae, obtuse acuminatae, loculis basi divaricatis, basibus glandulosis. *Ovarium* globosum ; stylus gracilis, 5–6 mm. longus. *Capsula* globosa, 2 mm. longa, matura glabra.—*B. Cogniauxii* King in Journ. As. Soc. Beng. lxxix. i. p. 13, et Ridl. Fl. Mal. Penins. i. p. 773, non Stapf.

MALAY PENINSULA. Perak, Goping, *King's Collector* 553 (type), Wray 2984 : Kelantan, Channing, *Ridley* : Pahang, Teku River, Gunong Tahang, *Haniff and Nur* 8060 ; Telon, *Ridley* 13549 ; Kuala Lipis, *Machado* 11587 : Selangor, Bukit Tuku, *Ridley* 7304, Ginting Bidai, *Ridley* 7328.

## LVII.—NOTES ON AFRICAN GRASSES: XI.\*

C. E. HUBBARD.

### A NEW GENUS OF GRASSES FROM BECHUANALAND.

In a collection of grasses recently received from the Division of Plant Industry, Pretoria, for comparison, a panicoid grass which bore a superficial resemblance to certain species of *Digitaria*, was included. It differed markedly, however, from that genus in the structure of its spikelets, but clearly belonged to that group of genera which has been segregated by Dr. Stapf† as the *Digitariastrae*. The name *Megaloprotachne* is proposed for this grass on account of its large well-developed lower glume, a character which serves to separate it from all allied genera. The genera of the *Digitariastrae* are characterised by the lemma and palea of the fertile floret being cartilaginous-indurated but not rigid at maturity, and by the margins of the former being more or less hyaline and flattened against the back of the palea. This group, together with certain other genera of the *Panicaceae*, has been studied in detail by Mrs. A. Chase‡. The genera given by her as having

\* Continued from K.B. 1929, p. 263. † Prain, Flora of Tropical Africa, ix. 13 (1917). ‡ Proc. Biol. Soc. Wash. xix. 183–192 (1906) and xxiv. 103–159 (1911).

the above type of fertile floret are the following :—*Leptocoryphium* Nees, *Anthaenantia* P. Beauv., *Valota* Adans. (*Trichachne* Nees), *Digitaria* Hall. (*Syntherisma* Walt.), *Leptoloma* Chase, *Chloridion* Stapf, and *Acritochaete* Pilger. To these Dr. Stapf has added *Alloteropsis* Presl. The last three genera differ from the new genus in having slender-awned spikelets, whilst the first five may be distinguished in having minute or obsolete lower glumes.

The genera with which *Megaloprotachne* shows greatest affinity are *Anthaenantia* and *Valota*. From both it differs in its large lower glume, which is as long as the spikelet, and also in the shape of the spikelets. In *Anthaenantia* they are obovoid, in *Valota* lanceolate. In addition the fertile floret of *Anthaenantia* has a boat-shaped lemma and the spikelets are arranged in narrow panicles. *Valota* has a somewhat similar type of inflorescence to that of our genus, the spikelets being arranged in secund spike-like racemes; it has, however, a sterile lower floret which is reduced to the lemma, and a lanceolate fertile floret.

*Leptoloma* may be distinguished by its different type of inflorescence, the spikelets being sparsely scattered on the branches of a diffuse panicle. *Leptocoryphium* has panicked spikelets, the lower glume absent, the lower floret sterile and reduced to the lemma, and the fertile floret open at the apex due to the hyaline tip of its lemma.

The only genera amongst the African grasses with which our new genus is likely to be confused are *Digitaria* and *Urochloa*. From the former it may be readily distinguished by its large lower glume and male lower floret with well-developed palea, and from the latter by its different type of fertile floret, that of *Urochloa* having the lemma crustaceous, very obtuse, mucronate at the apex, and with firm narrowly involute margins.

I am greatly indebted to Dr. Stapf for numerous suggestions in working out the relationships of this new genus.

**Megaloprotachne** C. E. Hubbard, gen. nov., affinis *Anthaenantiae* P. Beauv. et *Valotae* Adans.; ab utroque genere gluma inferiore spiculam aequante, spiculis lanceolato-ovatis vel lanceolato-ellipticis, ab illo spiculis in racemis spiciformibus dispositis, gluma superiore trinervia, anthoecio supero plano-convexo, ab hoc anthoecio supero elliptico acute acuminato differt.

*Spikelets* lanceolate-ovate to lanceolate-elliptic in dorsal view, acute or acutely acuminate, semi-elliptic-oblong or semi-ovate-oblong in profile, flat in front, convex on the back, falling entire from their pedicels, paired, secund and abaxial on the triquetrous rhachis of slender spiciform racemes; lower floret ♂, upper ♀. *Glumes* dissimilar; lower as long as the spikelet, involute and acute at the tip, oblanceolate-oblong and rotundately obtuse when flattened, thinly membranous except for the hyaline nerveless tip, finely 5-nerved with the lateral nerves approximate, glabrous and

very smooth ; upper about two-thirds to three-quarters the length of the spikelet and closely appressed to the upper floret leaving the sides of the latter exposed, lanceolate to ovate-lanceolate, obtuse, thinly membranous with hyaline tip and margins, 3-nerved, densely pilose between and outside the lateral nerves. *Lower floret* : valve ovate or elliptic, acutely acuminate, nearly as long as the spikelet, flattened on the back and with very narrow inflexed margins, the latter membranous, the remainder hyaline, 5-7-nerved with the lateral nerves very close together, long-pilose on the inflexed margins ; valvule ovate- to elliptic-oblong, subacute, hyaline, 2-keeled, with the keels narrowly winged. *Upper floret* : valve elliptic and acutely acuminate in dorsal view, semi-elliptic-oblong in profile, chartaceous with narrow flattened hyaline margins, 3-nerved, glabrous and smooth, at first whitish but becoming chestnut-brown at maturity except for the hyaline margins ; valvule as long as the valve, 2-nerved. *Lodicules* 2, minute. *Stamens* 3 ; anthers linear. *Ovary* glabrous ; styles free, terminal, long, exserted at the apex ; stigmas plumose. *Caryopsis* elliptic, dorsally compressed, plano-convex ; hilum subbasal ; scutellum half the length of the caryopsis.—An annual grass ; ligules membranous, ciliolate ; leaf-blades linear, flat ; racemes more or less distant on a common axis ; rhachis triquetrous, flexuous ; pedicels unequal ; spikelets loosely appressed and more or less imbricate.

Species 1, in Bechuanaland.

**M. albescens** C. E. Hubbard. *Culms* geniculately ascending and rooting from the lower nodes, up to 75 cm. high, moderately stout, terete or grooved on one side, simple or branched from about or above the middle, glabrous and smooth, up to 9-noded, with the internodes 4.5-8 cm. long. *Leaf-sheaths* slightly longer to slightly shorter than the internodes, loose, terete, striate, pilose or villous at the nodes, the remainder softly pubescent except for the uppermost which is glabrous and smooth ; ligules truncate, about 1-1.5 mm. long ; blades linear from an equally wide base, finely acute, up to 20 cm. long, 5-6 mm. wide, flat, finely pubescent or the upper glabrous except for the minutely asperulous primary and secondary nerves, margins yellowish, crinkled and cartilaginous. *Inflorescence* up to 16 cm. long, laterally exserted from the uppermost leaf-sheath, more or less contracted, composed of 7-9 racemes ; primary axis slender, flexuous, up to 5.5 cm. long, finely grooved, overtopped by the racemes ; racemes 6-12.5 cm. long, suberect, simple or rarely with short branchlets at the base bearing 2 spikelets, flexuous, solitary, rarely paired, 0.5-1.5 cm. apart ; rhachis 0.3 mm. wide, pubescent at the base, the remainder glabrous and smooth ; pedicels unequal, both very slender, more or less appressed, angular, glabrous and smooth, with minutely discoid tips, one up to 1 mm. long, the other straight or more often flexuous, up to 5 mm. long. *Spikelets* 4-4.5 mm. long by 1.3-1.5 mm. wide, whitish. *Lower glume* 4-4.5 mm. long ; upper 3.3-3.5 mm. long, pilose with short

very fine appressed white hairs. *Valve of lower floret* 3·5–3·75 mm. long, with 3 small glands on each margin, here long and appressedly pilose; *valvule* 3·2–3·5 mm. long. *Valve of upper floret* 3 mm. long. *Anthers* 1·6–2·5 mm. long. *Caryopsis* pale, almost 2 mm. long.

SOUTH AFRICA. Bechuanaland: Kuruman; Vaal Kameel, 25th March, 1928, *Pole Evans* 2075.

## LVIII.—MISCELLANEOUS NOTES.

**Botanical Expeditions: Somaliland.**—Three letters have been received from Mr. C. L. Collenette, the botanist who is accompanying the Joint British-Italian Boundary Commission (*K.B.* 1929, pp. 238, 239). The first letter, written on the 26th of August, announced his arrival at Berbera, and gave details of the preparations incidental to the Expedition.

Berbera, where the thermometer had not been below 90° F. for a fortnight, with vegetation stripped by locusts and a sandstorm blowing every day for some twelve hours, offered little opportunity for botanizing. A visit to Hargeisa, a hill station 108 miles southwest of Berbera, created a more favourable impression of the country.

The second letter, dated the 24th September, was written from Baran, 3000 ft. alt., about half way down the eastern boundary of British Somaliland. This he describes as a broad rocky valley, containing the only water in the district—two pools in the dry bed of a stream—and showing a good sample of the scanty vegetation, which seems to vary but little for a good many miles round.

The locusts, to which he referred in his previous letter, covered everything along his journey up to Baran, but at that altitude they had largely disappeared and the vegetation was recovering. Although there had been a few showers, an important item in a district with so small a rainfall, the number of plants in flower was very disappointing. His collections, which included the grasses, had reached to over eighty numbers, and possibly represented some 30 per cent. of the flora of the district. He remarks that it pays to walk over almost every yard of the ground, as the rarer plants are often present in one small area and do not appear elsewhere. Sometimes a single shrub is found in flower, while all other plants of the same species in the neighbourhood are bare and leafless.

A general outline of the chief physiognomic types of vegetation has been attempted, but as so many of the plants were leafless it has not yet been possible to name the principal constituents. The grasses and evanescent herbaceous ground vegetation are only just beginning to appear after the first showers.

He mentions that he hopes to visit the Al Hills, some 60 to 70 miles north of Baran, which ascend to 6000 ft. No botanist has ever visited these hills, and the highest zone of the last 1000 ft. is reported to be covered with green vegetation, in marked contrast to the burnt-up country of the lower zones.

In a subsequent letter of the 1st October he describes the precautions he had to take to obtain flowering specimens of bulbous plants. These were noted when in bud and little protective stone barricades were built round each plant. Only thus could the flowers be saved from goats and wild animals.

**Index Kewensis, Supplement VII.\***—The monumental Index Kewensis and its successive Supplements are recognized as an indispensable part of the equipment of any important botanical institution, affording as they do a ready means of reference to the names, the first places of publication, and geographical distribution of all the known genera and species of Flowering Plants published from the year 1753 down to the present day. In works of this character, the prompt appearance of the successive issues is of great importance, and it is therefore highly gratifying that new arrangements mentioned in the preface have made it possible to publish the seventh Supplement, which covers the period 1921-25, only three years after the appearance of the sixth, which covered the preceding quinquennium, 1916-1920.

It may not be out of place to mention here a few of the many ways in which the Index is of service. If any question arises as to the correct or original way of spelling a botanical name, the original spelling can be obtained from the Index, though obvious errors are of course corrected. Those interested in horticulture or economic botany may find out the native countries of the plants with which they are dealing and verify the names by means of comparison with the original descriptions cited in the Index. To the research worker in systematic botany of the Flowering Plants, the Index and especially its Supplements are absolutely indispensable, in view of the widely scattered nature of the literature: in illustration of this fact, it may be mentioned that about four hundred different periodicals were examined during the preparation of the present Supplement.

As each successive Supplement has been prepared, it has been the aim of those responsible to adopt any practicable modifications which would increase the general usefulness of the Index without altering its format. From the third Supplement onwards, lists of addenda, which were found to be very troublesome to consult, have been omitted, any new or corrected entries being inserted in the next issue. From the fourth Supplement, the dates of publication, so important for purposes of priority, have been inserted in all cases. The geographical information supplied is now much more detailed, the precise country or province being stated wherever practicable.

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\*Index Kewensis Plantarum Phanerogamarum Supplementum Septimum nomina et synonyma omnium generum et specierum ab initio anni MDCCCXXI usque ad finem anni MDCCCXXV nonnulla etiam antea edita complectens ductu et consilio A. W. Hill confecerunt Herbarii Horti Regii Botanici Kewensis Curatores. Oxonii e prelo Clarendoniano MDCCCXXIX. Pp. 260. 4to. Price £3 15s.



Where new names are based on previously published ones, the latter are cited so that the connection between the two names may be apparent.

A novel and valuable feature incorporated in the present Supplement is a separate list of new genera, arranged under their families. This enables a botanist who is interested in one particular family, such as Orchidaceae for example, to see at a glance what new genera belonging to this family are contained in the Supplement, information which is unobtainable from other sources without a prohibitive expenditure of time.

The present Supplement contains 260 pages, as compared with 222 in Supplement VI, the increase being due partly to the increased activity of botanical research during the period, and partly to the inclusion of many earlier references which had been generally overlooked owing to their having been published in obscure periodicals or books. As regards the general style and typography it may suffice to say that the present volume worthily upholds the high traditions of the Clarendon Press.

The preface is here reproduced.

#### MONITUM

Hoc septimo Indicis Kewensis Supplemento inclusa sunt non modo quot nova nomina inter quinquennium 1921-5 sunt edita, sed multa etiam quae ex Indice ipso et Supplementis I—VI erant omissa.

Nomina Familiarum quae Generum nomina singula sequuntur e libro 'Genera Siphonogamarum' auctoribus Dalla Torre et Harms sumpta sunt; sed sicubi Familia alia datur in libro 'Genera Plantarum' auctoribus Bentham et Hooker, huius Familiae alterius nomen est additum.

Quo maiori sit usui libellus eis qui singulis Familiis operam dant, hoc primum Supplemento tabulam dedimus nominum genericorum novorum in eo inclusorum; haec sub Familiis propriis sunt disposita.

Bello illo Magno factum erat ut Supplementa V et VI serius iusto ederentur: nos meliori fortuna usi opus maturare et hoc septimum Supplementum tertio post sextum editum anno in lucem proferre potuimus. Quo in genere multum adiuvit quod Herbario Kewensi accessit custos M. L. Green, quae Indicis nostri parandi a Doctore T. A. Sprague per hos duos et viginti annos summa diligentia navatum opus susceperet.

ARTHUR W. HILL

Datum ex horto Regio Kewensi  
mense Maio A.S.MCMXXIX.

### **Council for Scientific and Industrial Research, Australia.\***

—We learn from the Journal of the Council that rapid progress had been made with the building of the laboratories of the Division of Economic Entomology at Canberra. The Empire Marketing Board has agreed to contribute £25,000 on a £1 for £1 basis with the Council towards the capital cost of equipping the Division with its necessary laboratories, insectaries, apparatus, small field stations, etc., and also to contribute on similar terms an amount of about £37,000, spread over a period of five years, towards the running expenses of the Division.

The building has been erected in such a way as to allow for the addition of a central administrative building and a corresponding laboratory building for the Division of Economic Botany. The central building that has been proposed will contain the administrative offices of both Divisions and also a common library and rooms for a museum, herbarium and records.

We also note that at the request of the Government, the Council has formed a Committee consisting of Sir David Masson (Emeritus Professor of Chemistry, University of Melbourne) (Chairman), Sir Henry Braddon (a member of the Senate of the University of Sydney), Sir Thomas Lyle (Emeritus Professor of Natural Philosophy, University of Melbourne), Sir Robert Garran (Solicitor-General), and Mr. A. J. Gibson (late Professor of Engineering, University of Queensland), with the members of the Executive as *ex officio* members, to report on the establishment of a University of Canberra, particularly from the point of view of its relation to the scientific work of the Council to be carried out in that place, and also in relation to the scientific work of other institutions in Canberra. From this point of view, the possibilities of the establishment of a post-graduate research University are being explored.

Since this number of the journal was published the welcome news has been received from the Council that the Federal Parliament has approved the erection of the Botanical building, which will include the National Herbarium at Canberra. It is hoped that the building may be completed within the next twelve months.

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**Botanical Magazine.**—The second part of Volume cliii (1927) contains the following plant portraits :—

*Rhododendron calophytum* Franchet (t.9173), discovered in 1869 by Père G. David in Western Szechuan; *Gaultheria Veitchiana* Craib (t.9174), with turquoise-blue fruits, also a native of W. Szechuan where it was discovered by David; *Cyrtanthus rhododactylus* Stapf (t.9175), a new species from South Africa, but at present only known from cultivated specimens; *Siphonosmanthus suavis* Stapf (t.9176), a new genus separated from *Osmanthus* on the

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\* Commonwealth of Australia, Journal of the Council for Scientific and Industrial Research, August 1929, Vol. 2, No. 3.

length of the corolla tube and high insertion of the stamens. The genus includes *S. Delavayi* Stapf and *S. suavis*, both of which species were doubtfully placed under *Osmanthus* by Franchet and King respectively.

*Acacia rhetinoides* Schlechter (t.9177), the next illustration, is a well-known plant first collected by Dr. A. Behr near Adelaide, about 1847, and also found in Victoria by Robert Brown; *Salvia caerulea* Benth. (t.9178), a fine blue *Salvia* from Eastern and South-Eastern Brazil and Paraguay, discovered by Sellow in S. Brazil about 100 years ago; *Encyclia Mooreana* Schlechter (t.9179), a native of Costa Rica, the plant figured having been sent to Kew by Mr. C. H. Lankester; *Cosmos diversifolius* Otto (t.9180), from Mexico, a plant which was first in cultivation at the Berlin Botanic Garden in 1835 and was sent thence to the Birmingham Botanic Garden. The plant figured was grown in the Botanic Garden, Cambridge.

*Briggsia amabilis* Craib (t.9181) is an interesting Gesneriad from N.W. Yunnan and is followed by a plate of *Potentilla nepalensis* Hook. (t.9182), a plant grown for many years in the Rock Garden at Kew. It is a native of the Outer Himalaya from Nepal to Hazara. The final plate depicts *Euonymus grandiflorus* Wall. f. *salicifolia* (t.9183), an attractive Spindle Tree from India, Upper Burma, and China.

**Flora of the Cape Peninsula.\***—Perhaps in no other part of the world can be found a small area with so rich a flora as the Cape Peninsula. From a phytogeographical standpoint its flora is of very great interest, for the peninsula is separated from the remainder of South Africa by a wide stretch of sandy dunes, the Cape Flats, which must have proved a serious barrier to the migration of species.

A complete flora of the area has long been and still is a desideratum. The foundation was well laid for it by the late H. Bolus and by H. A. Wolley-Dod, in their List of the Flowering Plants and Ferns of the Cape Peninsula, published as long ago as 1903. Mrs. Levyns has now gone a step further and provided a book whereby a visitor or student may learn the family and genus of any flowering plant in the area.

The system followed in Mrs. Levyns' "Guide to the Flora" is that of Engler, which, according to the author, "is more in accordance with natural relationships than the older systems of Bentham and Hooker." This was not Sir Joseph Hooker's view, and who knew more about relationships than Hooker? As exemplified by the Cape Peninsula flora the weak points of the Engler system are particularly noticeable. It brings into juxtaposition such widely diverse families as the Peppers and Willows, the Nettles and

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\*A Guide to the Flora of the Cape Peninsula, by M. R. Levyns, with 199 Illustrations by Miss E. McCullough and the Author. Juta & Co., Ltd., Cape Town and Johannesburg, 1929, pp. xv. + 284, figs. 199. Price 15s. 6d.

Proteas, the *Polygalaceae* between the *Rutaceae* and *Euphorbiaceae* far away from their true relatives, whilst the *Cucurbitaceae* are placed between the *Dipsacaceae* and *Campanulaceae*. We fancy that the young South African student of botany will find it difficult to recognise any relationships between these families, to mention only a few. Fortunately the Peninsula harbours no Balsams (*Impatiens*), to puzzle him as to why they should be placed near the Horse-chestnuts, far removed from their natural position next the *Geraniaceae*, which are such an important element in the South African flora.

Keys to and descriptions of the families and genera are given, with short notes on habitat and the flowering period of the genus as represented on the peninsula. The work is illustrated by small black and white figures to the number of 199, which should prove of great value to the student, but some of these might have been made more helpful by the addition of a longitudinal section and other parts of the flower. The figure of *Podalyria calyptrata* hardly does justice to that beautiful shrub as I saw it around Kirstenbosch a year or so ago, whilst in that of *Kiggelaria africana* (p. 181) a fruiting twig is superimposed on the upper half of a figure representing a male shoot. Nevertheless the student will find this book very useful indeed for gaining a preliminary knowledge of the flora of the Cape Peninsula, and Mrs. Levyns is to be warmly congratulated on the publication of her work, which should serve to whet the appetite for something more.

J. H.

**Tapping Peru-Balsam.**—Balsam of Peru, yielded by *Myroxylon Pereirae* Klotzsch, and used not only in perfumery and soapmaking, but also in medicine, is obtained from trees growing in the wild state in parts of Central America, chiefly on the Sonsonate Coast, San Salvador. The methods employed by the natives for extracting the balsam are crude and liable to cause severe injury to the tree, resulting often in death. To what extent trees occurring wild in this region will, in the future, be able to supply the demand for this balsam, it is impossible to estimate. On analogy with other plant products of commercial value that have in the first place been obtained only from the wild source but have subsequently become extensively cultivated, it does not seem unreasonable to assume that Peru-Balsam from cultivated trees might eventually largely supplement if not entirely displace that from the wild source in the markets of the world.

In this connection it is interesting to follow the results of experiments on tapping with Peru-Balsam trees at the Paramaribo Agricultural Experiment Station in Surinam. It would appear from a preliminary account of these experiments by Dr. Stahel \*

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\* "Nieuwe Onderzoekingen over Perubalsem uit onze Koloniën." Berichten van de Afdeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut. No. 30, pp. 20 (Druk de Bussy, Amsterdam, 1927).

that trees over 20 years old are established at the Station. In 1917 and 1918 these trees were tapped according to the San Salvador method, but the wounds had not completely healed as late as 8 years afterwards and in many cases rotting of the wood had taken place or injury from termites had occurred.

The usual procedure for obtaining the resin in San Salvador is first to beat the trunk of the tree over a surface of approximately half a square foot in several different places with a round stone or other blunt instrument. This softens the bark, the outer portion of which is removed, leaving the inner portion still adhering to the wood. The surfaces so treated are then covered with pieces of cloth to absorb the exudation. After several days these exposed surfaces are heated by means of torches. This induces a more copious flow of balsam, which is again collected by means of the cloth. When exudation has again ceased cuts are made on the exposed surface which causes a further flow. After this the inner bark is removed leaving the wood exposed, from which balsam again exudes and is collected on a cloth as before. The rags are eventually boiled for some time in water, which causes most of the balsam to sink to the bottom of the vessel. When cool, the water, which contains many of the impurities that were mixed with the balsam, is poured off, and the balsam is poured into separate containers. Rope presses are used for extracting the remainder of the balsam from the cloths.

It was found at Paramaribo that wounds to the trunk of 1 cm. in width in place of the usual 10 to 20 cms. healed completely in less than 6 months. In arranging the tapping cuts the boles of the trees were divided into sections 30 cms. in depth and alternate sections only were tapped at any one time. The tapping cuts were made 0.8 cm. in width, being inflicted with a rectangular *Hevea* tapping knife, and ran parallel with the axis of the trunk at distances of 10 cms. from one another. It was only in a few instances that resin appeared in any of the incisions before burning, and then only in a very small quantity. Burning was done by means of a hot iron approximately the length and breadth of the incisions and resulted in a copious flow of balsam in 8 to 10 days from burning. As soon as the balsam began to flow a piece of cotton yarn was placed in each groove to collect the balsam and prevent it running down the side of the trunk. When the balsam had ceased flowing the pieces of yarn were collected and the balsam extracted with alcohol, accurate figures relating to yield per tree being desired in this instance.

After two months from burning, the wounds had almost closed as a result of active callus formation. The incisions were again burned, resulting in a further flow of balsam, and a third burning was given at the end of another two-month period. Healing after the third burning was much slower, and a period of 6 months had elapsed before callus growth became active and the wounds again healed.

It is considered that after three burnings the trees should be allowed to rest a year, to allow of complete healing, after which the other untapped areas can be worked, followed by another period of rest. With this method a continuous annual yield of 3 kgs. of balsam per tree, with 20-years old trees, is regarded as possible. In the Paramaribo experiments between 300 and 350 gms. of balsam was yielded per square metre of trunk surface by the larger trees, after three tappings. This worked out to 5 kgs. of balsam per tree.

It is admitted that this method of tapping involves considerably more labour than the crude method employed in San Salvador, and would result in higher tapping costs. It is, however, difficult to draw comparisons between the two methods, as one is applied to trees in the wild state and the other to cultivated trees.

The tree, which occurs either singly or in groups in its natural habitat, reaches an average height of 50 feet or more, and possesses a very spreading crown. The spacing recommended for plantation purposes is given as 40 to 45 feet, and light sandy soils are claimed to lead to better development of the trees than heavy or low-lying soils.

F. N. H.

**Sisal—Production and Preparation.\***—This book, which is for the most part a compilation, should serve a very useful purpose in bringing together for those interested in Sisal the very scattered literature on the subject. In the first of the two Parts into which the book is divided a Chapter is devoted to sisal in each of the more important sisal-producing countries, eleven being dealt with. This is followed by a discussion on the subject of alcohol from sisal refuse, a proposed sisal planters' association, and other miscellaneous matter. Part II deals primarily with extraction and preparation of the fibre and illustrates in great detail the various types of machinery in use, figures of machines supplied by the leading makers being incorporated.

In the Introduction the author states that it was not intended to "bring together a scientific work on the subject," and the critical reader must, therefore, make due allowance when disposed to question occasional phrases such as "the bacteria of Panama disease." The appearance of "The Question of Panama Disease" as a sub-title on the title page of a work on Sisal is perhaps open to question. A compilation of this nature is necessarily no light task and the editor has every reason for satisfaction in having produced a work, the first of its kind, that should prove invaluable to those engaged in, or about to undertake, the cultivation and commercial production of Sisal.

F. N. H.

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\*"Sisal—Production and Preparation, comparative notes on other fibres. The question of Panama Disease." Edited by H. Hamel Smith. Messrs. John Bale, Sons and Danielsson, Ltd., 83-91, Great Tichfield Street, London, W.1, 1929, pp. 384, pl. 13, fig. 23. Price 21s. 0d. net.

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# BULLETIN OF MISCELLANEOUS INFORMATION Appendix I 1929 ROYAL BOTANIC GARDENS, KEW

## REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1928.

### General.

**STAFF.**—During 1928 the following changes have taken place:—Mr. W. Irving, Assistant Curator in charge of the Herbaceous and Alpine Department, retired after 38 years' service, and was succeeded by Mr. A. Edwards, from the Public Parks Department, Manchester. Dr. J. M. Cowan was appointed a Temporary Botanist in place of Miss M. B. Moss, seconded to replace Mr. J. Hutchinson during the latter's absence in South Africa. Mr. E. M. Marsden-Jones, F.L.S., has been appointed an Honorary Associate for Transplant and Breeding Experiments. Mr. C. A. Smith, B.Sc., of the Division of Botany, Department of Agriculture, Pretoria, was appointed by the Government of the Union of South Africa, Assistant for South Africa in the Herbarium at Kew, in succession to Miss I. C. Verdoorn, and entered on his duties in March.

**EMPIRE MARKETING BOARD.**—Having regard to the importance from an economic standpoint of a complete knowledge of the plant resources of the Empire, the Empire Marketing Board has made, through the Ministry of Agriculture and Fisheries, a grant of £2,000 to provide for the continuation of the work of making available for study the accumulations of botanical material in the Herbarium Store. In addition, a further grant of £4,000, for the year 1928-29, was made for the continuance of the special projects outlined in last year's Review (*K.B. Appx. I, 1928, p. 2*).

**OFFICIAL VISITS.**—The Director, as recorded in the Annual Review of last year, paid official visits to Australia and Tasmania, New Zealand, Malaya and Ceylon, during the winter and spring of 1927-28; he also visited Java and the Botanic Gardens, Buitenzorg.

He left Kew on November 3rd, 1927, and joined the Orient R.M.S. "Osterley" at Toulon on the following day, arriving at Colombo on November 19th. Here he was met by the Hon. F. A. Stockdale, and dined with His Excellency the Governor.

On arrival at Perth, Western Australia, on November 29th, the Director was met by the State Chairman and other officials of the Commonwealth Council for Scientific and Industrial Research and was the guest of His Excellency the Governor. Conferences were

held with the Botanical, Agricultural and Forestry officers, and a well-arranged tour was made in the S.E. portion of the State, in the course of which the Jarrah and Karri forests and the wheat belt around Kellerberrin were visited.

The Director took the night train from Kellerberrin to Kalgoorlie on December 5th, and visited the Sandalwood areas and plantations near Kalgoorlie.

Travelling by the Transcontinental train from Kalgoorlie on December 7th, Port Augusta was reached, after crossing the Nallarbor Plain, on the afternoon of December 9th, and from here the Director went to inspect the Koonamore Reserve with Professor T. G. B. Osborn, and arrived at Adelaide on December 12th. Here the Botanic and other gardens and the Waite Institute were visited, and the Director received the Honour of the D.Sc. degree from the University, and was entertained by the Lieut. Governor. Melbourne was reached on December 17th, the Director being met by Sir David Masson, State Chairman, and Dr. Rivett, Secretary of the C.C.S.I.R., who was so largely responsible for the excellent arrangements made for the whole Australian tour.

A Civic reception was accorded by the Lord Mayor and a reception was also given by the Royal Colonial Institute on the day of arrival, and later the Director was entertained by His Excellency the Governor. He visited the Botanic Garden, the Herbarium and the University, and made various botanical excursions before proceeding to Canberra, which was reached on December 28th. Here some time was spent under the guidance of Mr. C. E. Lane-Poole, Inspector General of Forests.

The next point to be reached was Sydney. The Director was met on arrival, on December 30th, by Professor Watt, State Chairman of the C.C.S.I.R., and Dr. Darnell Smith, Director of the Botanic Gardens. He visited the Botanic Gardens, Herbarium, Technological Museum and the University, and made excursions to the Blue Mountains with Dr. J. McLuckie, to Eucalyptus forests near Taree, to the National Park, and to La Perouse where Sir Joseph Banks first botanised in Australia.

The Director then went to Tasmania to attend the meeting of the Australian Association for the advancement of Science at Hobart. He was met on January 12th, 1928, by Mr. L. Rodway, Hon. Botanist to the Government of Tasmania, and inspected the Herbaria at the University and the Botanic Gardens. He was also able to make an expedition to the National Park near Lake Fenton (about 4,000 ft. alt.), with Mr. A. V. Giblin.

Leaving Hobart on January 17th and transshipping at Melbourne next morning, the voyage was made by the S.S. "Manuka" to New Zealand and the Bluff was reached on January 22nd.

On arrival next day at Dunedin, the Director was met by Sir James Allen and Mr. D. Tannock, Superintendent of the Botanic Garden, and others. Long visits were paid to the Botanic Garden and

other gardens, and an address was delivered at a Reception given by the Mayor of Dunedin. The public garden at Oamaru was visited with the Mayor and Superintendent on January 24th, en route for Wellington, which city was reached in the early morning of January 25th. Here the Director was met by Dr. L. Cockayne, F.R.S., Mr. E. Phillips Turner, and Dr. E. Marsden, Secretary to the Department of Scientific and Industrial Research, and later was welcomed by the principal Government officials connected with Agriculture, Forestry, etc. With the Mayor of Wellington (Mr. Troup), and others, a visit was paid to the Otari Open Air Museum and later to the Wellington water works reserve and to the Botanic Gardens. The Director was greatly honoured by being elected an Hon. Member of the New Zealand Institute during his stay at Wellington.

A Reception was also accorded the Director, at which a special Flower Show of New Zealand Alpine plants was arranged (see *Gard. Chron.* 17 Nov. 1928, pp. 388, 389).

The Director then left for Nelson with Dr. Cockayne, Mr. Phillips Turner and Mr. A. Cockayne, and on arrival, on January 27th, he visited the Cawthron Institute under the guidance of Dr. R. J. Tillyard, F.R.S., and inspected the Nelson Rock Garden and some fruit orchards. Journeying by Blenheim and Kai Koura, he saw the Forestry plantations at Hanmer and reached Christchurch in the evening of January 29th. Next morning the journey to the West Coast was made via Arthur's Pass and the Otira Gorge to Hokitika and the Franz Josef Glacier. On February 1st he ascended the mountain Aleck's Knob (4,288 ft.), with Dr. H. H. Allan, Mr. G. H. Cunningham and Mr. Alfred Cockayne, and returned to Christchurch on February 2nd, when he was received by the Mayor at the Town Hall, and delivered a lecture.

The Botanic Garden, Museum and Herbarium were inspected and a visit was paid to Riccarton Bush. The Governor General honoured the Director with an invitation to luncheon.

Auckland was reached on February 5th and a Reception was accorded by the Mayor and an Address was delivered at the University. Excursions were made to the Kauri Forests, Rangitoto Island, and other places of botanical interest, and the return journey was made via Rotorua and the Forestry plantations, Wairakei, the Tongoriro National Park, Wanganui, to New Plymouth, which was reached on February 10th. Here, after a Civic welcome and an inspection of the Public Garden and Messrs. Duncan and Davies' nursery of New Zealand plants, the Director ascended Mt. Egmont to the snow line and studied the vegetation.

He returned to Wellington via Palmerston North to see the Esplanade Gardens and the Massey Agricultural College, and some of the New Zealand Flax plantations and flax mills. Wellington was reached on February 13th, and, after visiting the Government Herbarium, with Mr. W. R. B. Oliver, and being received by Mr.



Coates, the then Prime Minister, the Director left New Zealand for Sydney on February 14th by the S.S. "Tahiti." Transshipping at Sydney to the S.S. "Orungal," he reached Brisbane on February 20th, and was met by Mr. C. T. White, Government Botanist, and Mr. E. W. Bick, Director of the Botanic Garden.

Visits were paid to the Gardens, Herbarium, Forestry Museum and the University. The Director was entertained by His Excellency the Governor, the Vice Chancellor of the University, and the Lord Mayor, and made excursions to study the vegetation near the city.

Leaving Brisbane on February 24th by the K.P.M. S.S. "Houtman," the Director reached Sourabaya, Java, on March 9th, after calling at Macassar, Celebes. He arrived at Buitenzorg on March 12th, and was the guest of Dr. Docters van Leeuwen, Director of the Botanic Gardens. The Gardens, Herbarium, Museums, and the various scientific Institutes in Buitenzorg were visited and an excursion was made to the Mountain garden at Tjibodas and to Mt. Gede.

Leaving Java by the S.S. "Op ten Noort" the Director landed at Singapore on March 19th, and was the guest of His Excellency the Governor during his stay. After visiting the Botanic Gardens with the Director, the Herbarium and the Raffles Museum, the journey was resumed by night train to Kuala Lumpur in order to see the work of the Agricultural Department at Kuala Lumpur, Serdang, Klang and Krian. The Acting Director of Agriculture and the Officers of the Department afforded the Director the fullest opportunities of inspecting the various activities of the Department, and visits were also paid to the Forestry Museum and to the Rubber Research Institute.

Penang was reached on March 22nd, and, after inspecting the Waterfall Gardens with the Assistant Curator, the Director resumed his homeward journey by the P. & O. S.S. "Kashmir" on March 24th for Ceylon. On arrival at Ceylon on March 28th, he was taken by Mr. Stockdale to Peradeniya and Kandy, via Heneratgoda and Kegalle Experiment Station, and at Kandy and later at Nuwara Eliya he was the guest of His Excellency the Governor. During the stay at Peradeniya, the Botanic Gardens, Herbarium, the Research Laboratories and the Experiment Station were visited, and conferences were held with the Director of Agriculture and the scientific officers of his staff.

At Nuwara Eliya, a visit was paid to the Tea Research Institute, after which the return to Colombo was made via the Hakgala Botanic Garden, Craig tea estate and the Rubber Research laboratories at Culloden. At Colombo the Director visited the botanical department at University College with Professor N. Ball.

He left Colombo on April 4th by the Orient R.M.S. "Ormonde," arriving at Toulon on April 20th, and Kew on April 21st, 1928.

The Assistant Director undertook a mission to Cyprus and to the Sudan at the request of the respective Governments and with the

concurrence of the Empire Marketing Board and the Ministry. He left Kew for Cyprus on November 3rd, 1928, to report on botanical and agricultural matters in the Island, in particular with reference to Citrus growing, which will entail a visit to Sicily on the return journey.

Khartoum was reached on December 6th, after a visit had been paid to the Horticultural Department, Egypt, on the kind invitation of the Egyptian Government. In the Sudan the Assistant Director has been asked to advise and report on various horticultural and forestry matters, and for this purpose an extensive tour has been arranged to enable him to inspect large tracts of interesting country.

At the request of the Governor of British Honduras, and with the concurrence of the Empire Marketing Board, the Economic Botanist, Mr. H. C. Sampson, paid a visit to that Colony to report on the prospects of Agriculture and the means by which agricultural development might be fostered by the local Government. He left England on July 26th and returned to this country on November 7th. As far as time permitted, he visited all accessible parts of the Colony. A report on his tour has been submitted to the Secretary of State for the Colonies, and has been published by the Empire Marketing Board.

Mr. J. Hutchinson, Assistant in the Herbarium, left Kew on July 28th, 1928, to undertake a collecting tour in the Union of South Africa, on the invitation of the Botanical Authorities of the Union and with the concurrence of the Empire Marketing Board and the Ministry. After an extensive tour in the Karroo with officers of the Botanical Survey of the Union, Mr. Hutchinson proceeded by Grahamstown and Natal to Pretoria, where Dr. I. B. Pole-Evans made arrangements for the continuation of his tour.

Through the kindness of General the Rt. Hon. J. C. Smuts, Mr. Hutchinson accompanied him on a tour in the Zoutspansberg Division as far as the River Limpopo. Mr. Hutchinson will be returning to Kew in March.

As a result of the tour, Kew has already received very interesting living collections of South African succulent plants, which are now being cultivated in the succulent pits.

In continuation of a tour commenced towards the end of 1927, Mr. F. N. Howes, Assistant, Museums, visited several Eastern countries during the earlier portion of the year in connection with investigations on bananas that are being carried out by the Empire Marketing Board. The countries visited were Malaya, Java, Siam, Burma, S. India and Ceylon. The chief object of the tour was to obtain a representative collection of the better types of edible bananas (potential shipping types) occurring in these regions, but, in addition, material of the larger-fingered seeding Musas was obtained. It is hoped these may prove to be of service in the banana breeding work

that is being carried on in the West Indies. This work is further referred to on p. 7.

As the selection of seedless and seeding bananas in the East involved a survey of all the varieties occurring in the areas visited, this afforded good opportunity for making a special study of varieties and their distribution. A full account of this feature of the work has been published (*K.B.* 1928, p. 305).

Mr. T. W. Taylor, Assistant Curator, Tropical Department, completed his visit to the Far East for the purpose of studying tropical plants in their native homes and to see the collections in Botanic Gardens. Visits were made to the Botanic Gardens of Penang, Singapore, Buitenzorg, Tjibodas, Peradeniya, Hakgala and Heneratgoda. The Public Gardens at Kuala Lumpur and Taiping were also visited, and excursions were made to the summit of Maxwell's Hill and Fraser's Hill in Malaya and to Mt. Gede in Java for the purpose of studying the mountain flora.

The foregoing visits were in connection with the grant from the Empire Marketing Board for overseas missions.

In addition the following visits were undertaken by members of the staff during the year.

On the invitation of the Charles University, Prague, the Director delivered three lectures at the University in October. The opportunity was taken to visit, on the return journey, the Botanic Garden and Botanical Institute at Munich, under the kind guidance of Professor Goebel, who presented several plants of interest to Kew. Visits were also paid to Dr. J. P. Lotsy at Velp, Holland, with whom hybridisation questions were discussed, to Professor F. A. F. C. Went at Utrecht, where the Botanic Garden and Institute were inspected, and to the splendid Colonial Museum at Amsterdam under the guidance of Professor de Bussy.

At the request of the Delville Wood Memorial Committee, and by arrangement with the Imperial War Graves Commission, the Assistant Director and Mr. Dallimore, Keeper of the Museums, visited France to report on the condition of Delville Wood, which is being maintained as the South African War Memorial, and to advise as to its future management. A second visit was paid later by Mr. Dallimore to report on the progress of the work.

The Keeper of the Museums attended the Annual Meeting of the Royal English Arboricultural Society at Inverness in August.

Mr. J. H. Holland, Assistant, Museums, attended the meeting of the Museums Association at Glasgow in July.

Mr. C. P. Raffill, Assistant Curator, Temperate Department, visited the Royal Botanic Garden, Edinburgh, and several of the more important gardens in the west and south-west of Scotland.

**ADVISORY WORK.**—The Director has been appointed President of the Imperial Botanical Conference to be held in London in 1930

immediately before the International Botanical Congress in Cambridge. He is also Chairman of the Sub-Committee dealing with Taxonomy and Nomenclature, with Mr. Cotton as Secretary.

The Assistant Director has been appointed one of the Secretaries of the International Botanical Congress.

Mr. H. C. Sampson represented the Government of India on the Financial Supervisory Body which has been set up to consider the establishment of Agricultural Bureaux and Correspondence Centres as recommended by the Imperial Agricultural Conference held in October, 1927.

In connection with the work of the Imperial Institute Advisory Committees on Plant Products, a collection has been made of the different races of *Acacia arabica* with the object of ascertaining by analyses their varying tannin content and of ultimately testing these races under cultivation both in the Sudan and in India. Seeds of Algarobilla (*Caesalpinia brevifolia*), and of Quebracho (*Schinopsis Balansae* and *Schinopsis Lorentzii*), have also been secured and distributed. With the funds made available from the Empire Marketing Board's grant, it has been possible to finance the purchase of a large quantity of the fruits of the Tung Oil plant, *Aleurites Fordii* and *Aleurites montana*. These fruits will be distributed to various parts of the Empire for trial cultivation.

OTHER ECONOMIC ACTIVITIES.—A large consignment of seeds of agricultural crops likely to prove useful has been obtained and forwarded to the Agricultural Department of British Guiana. Varieties of groundnut (*Arachis hypogaea*) from Central and South America have been obtained and forwarded to the Mycologist at the Durban Herbarium, who required the material for his research work on the "rosette" disease of groundnuts. Suckers from the species and varieties of bananas, collected last year in the East by Mr. F. N. Howes, have been despatched as they have become ready to the Imperial College of Tropical Agriculture, Trinidad, from the quarantine house at Kew. These are for the plant breeding work being carried on there with a view to producing a suitable banana which may be immune to "Panama disease."

Steps have been taken to procure herbarium specimens of and agricultural information on the cultivated varieties of *Sorghum* from all parts of the Empire, with a view to working out their classification and the distribution of the several species.

PUBLICATIONS.—Ten numbers of the *Kew Bulletin*, and three Appendices, were published during 1928.

A new edition of the Popular Official Guide, mentioned in *K.B.* Appx. I, 1928, was published in March, and a new edition of the Guide to Museum II appeared in the Autumn. Other publications are mentioned on pp. 25, 28-41.

THE ASSOCIATION OF ECONOMIC BIOLOGISTS.—The Association visited the Herbarium and Gardens on May 11th. Amongst the

exhibits placed on view in the Herbarium were a series of *Chaulmoogra* Oil plants, Sorghums, East African pasture grasses, Tropical African poisonous plants and various South African plants of economic importance.

**COURSES OF INSTRUCTION.**—As in previous years, special courses were arranged, at the request of the Secretary of State for the Colonies, for probationers and officers of scientific departments in the Colonies.

### The Gardens.

**VISITORS.**—The number of visitors to the Gardens in 1928 was 1,127,003, an increase of 48,915 on the figures of the preceding year. The greatest monthly attendance was in May with 229,210, the smallest being in December with 6,564. The highest daily attendance was 53,661 on Whit Monday, May 28th, and the lowest 7, on December 18th.

**PLANT HOUSES.**—The chief structural alteration made during the year was the enlargement of the annex to the Victoria Regia house (No. 10) in which the collection of insectivorous plants is shown to the public. The old annex was pulled down and replaced by a larger "lean-to" structure with the roof considerably lower; it is 50 feet long, 8 feet wide and 9 feet high. A stage 3 feet 6 inches wide is provided for the plants. The collection of insectivorous plants was very much injured by the sea-water episode of 1921 (see *K.B.* 1922, p. 1), the *Sarracenias* being almost entirely killed off. By means of gifts from other Botanic Gardens at home and abroad and by purchase, a good collection of *Sarracenias* has been got together again, although the plants are still small. The collection of *Droseras* made a particularly striking display during the summer, and several specimens of the Australian climbing species, *Drosera penicillaris*, are now in cultivation. A fine batch of the rare and not easily grown *Cephalotus follicularis* from S.W. Australia was on view throughout the year. We have also been able to secure again *Heliamphora nutans*, thanks to the kindness of the Regius Keeper of the Royal Botanic Garden, Edinburgh, and the interesting *Drosophyllum lusitanicum* from Portugal, as well as *Darlingtonia californica* from N.W. America. An excellent group of the Venus' Fly-trap (*Dionaea muscipula*)—a plant of very great interest to the general public—may also be mentioned. Judging by one season's experience, this new house is a great improvement on the old one from a cultural point of view—an improvement due, no doubt, to its lower elevation, which brings the plants nearer the glass and enables a much moister atmosphere to be maintained, both matters of the first importance in the cultivation of this group of plants.

**Temperate House.**—The large central block of the Temperate House has been repainted. Owing to an ingenious system of scaffolding used by the contractor, the work was completed in a

much shorter time than ever before. A word of acknowledgment is due to those concerned for the care they took, which resulted in a minimum of injury to the plants and very little inconvenience to the public and the Gardens Staff.

Frequenter of this house will remember that perhaps the most conspicuous feature there for many years has been a pair of Bunya-Bunya pines, *Araucaria Bidwillii*, native of Australia. They were planted soon after the completion of the building of this section in 1862. The tree planted in the southern half of the house has been failing for some years past, this being due mainly to its age. It reached the top of the house many years ago and since then has had to have its top cut off periodically. In recent years the lower branches continued to die off and it seemed desirable to replace it whilst the companion tree in the northern part of the house remained in its present fine condition. It was accordingly taken down during the summer, the soil in the bed renewed, and a healthy young tree of the same species planted in its place. In this way it is hoped that a feature of the house which has become almost traditional may be preserved.

Chinese Rhododendron House.—The plants in this house (part of the Temperate House Group) have mostly grown well during the year and have, in general, a very healthy appearance. Many of them are too young to have reached the flowering stage, but nearly sixty species blossomed during the season, commencing in January with a fine white form of the variable *R. irroratum*. The following is a list of the more uncommon and interesting species and hybrids that flowered:—*aureum*, *Bachii*, *bullatum*, *burmanicum*, *callimorphum*, *carneum*, *chaetomallum*, *ciliicalyx* x *moupinense*, *coriaceum*, *didymum*, *eriogynum*, *euchaites*, *facetum*, *floccigerum*, *glischrum*, *Griersonianum*, *Jenestierianum*, *keleticum*, *laxiflorum*, *leptothrium*, *litiense*, *Mackenzianum*, *megacalyx*, *mollicomum*, *Morii*, *moupinense* x *carneum*, *odoriferum*, *salignum*, *saluenense*, *Scottianum*, *sperabile*, *stenoplastum*, *stereophyllum*, *Wardii*, *Wilsonae*, F. No. 21706 sp. nov.

Tropical Fernery.—The transept of this house (No. 2), as originally built, was occupied by two central stages (between which ran a path from the doors to the centre of the house) and two side stages attached to the walls. The central stages and the central path have been cleared away and their place is now taken by a rectangular bed of soil raised about two feet above ground level and held in place by an informal arrangement of stones. In this the ferns, which were previously grown in pots on the stages, have been planted. Some very fine tropical tree ferns constitute the chief feature, and since they have been brought down nearer eye-level and provided with more head room, their remarkable beauty can be much more readily appreciated. Beneath them, and forming a ground cover, are the dwarfer ferns and some other ornamental stove plants which would be found as normal undergrowth in a Tropical forest. All the plants have taken readily to the new soil and grew vigorously during the summer.

Some of the Epiphytic ferns have also been fixed to curved tree branches spanning the side paths, in order to show the manner in which such ferns grow in their native habitats.

**Palm House.**—A small porch or lobby has been erected at the north-west entrance. Its object is to prevent the inrush of cold air, especially during a north wind, every time the door is opened. This happens more particularly on bright Sundays in early spring, when there is an almost constant succession of visitors entering the house at this end. The porch is built of iron and is of a neat design according well with the main structure. The inner main doors have also been reduced in height in order to lessen the size of the door opening and so minimise the admission of cold air.

**BROAD WALK.**—Visitors to Kew will remember that the sequence of Rhododendron groups along the Broad Walk, each with a rectangular bed in front of it for spring and summer bedding plants, was broken about midway, near the noble Turkey Oak, by a "horse-shoe" shaped arrangement of the paths at each side. The two curving paths which made the "horse-shoe" on the south-west side have been abolished and replaced by a single path made in continuation of that which leads from the Brentford Ferry Gate and the Rhododendron Dell. This alteration has provided space for four additional groups of Rhododendrons, each with its rectangular bed in front, so that now a continuous and practically uniform arrangement prevails throughout the entire length of this fine walk.

**"A SOWER."**—A presentation of great interest has been made to Kew, by the Royal Academy, of the statue of "A Sower" by the late Sir Hamo Thornycroft, R.A. This has been erected at the northern end of the Broad Walk on a pedestal designed by Sir Edwin Lutyens, R.A., and Mr. A. Drury, R.A.

**ROSES.**—The collection of dwarf Polyantha roses that occupied a group of beds on the south-west side of the Broad Walk was removed last autumn to the Palm House terrace, where twelve new beds have been prepared and planted. They now form part of the general collection of garden roses, situated mostly on the south-west side of the Palm House, which consists at present of 113 beds, each devoted to a single variety, and comprising altogether nearly 7,000 plants. The new beds were cut out of the lawn on the terrace and, to provide an additional setting of turf, the gravel path round the Palm House was reduced in width from ten feet to eight feet.

Neither the climate nor the general conditions prevailing at Kew can be regarded as altogether favourable for the garden varieties of roses, but the collection is now probably as large and representative as that of any public garden in the British Isles, including as it does Hybrid Perpetuals, Teas, Hybrid Teas, Bourbons, Musk Hybrids and dwarf Polyanthas. It certainly helps the multitude of rose lovers whose gardens are situated within the London smoke area to judge what varieties are likely to succeed best there.

A considerable renovation of the collection of Rambler roses in the little dell near the Pagoda was effected by some 500 new plants being put out there.

Kew was visited by the National Rose Society on July 3rd, during the International Rose Conference.

TREES AND SHRUBS.—During the great storm of Friday, November 16th, the magnificent elm standing on the lawn near the Broad Walk (Key Plan E.9) was blown down. This tree was probably the tallest in the Gardens and, being isolated sufficiently to be viewed from every side, it made much the most conspicuous feature in its particular area, and its disappearance is greatly to be regretted. As it lay on the ground it measured almost exactly 100 feet in length; its girth at the base was 18 feet; at 3 feet high, 16 feet. Except for the large Sweet Chestnut in the Spruce collection, which has a girth of 22 feet 9 inches at three feet from the ground, it had the largest trunk of any tree in Kew. The number of annual rings was about one hundred and ninety, which shows that the tree was planted some time during the regime of Frederick, Prince of Wales (1730-1751). It grew very quickly as a young tree, the annual rings at one time varying in width from  $\frac{1}{2}$  inch to  $\frac{3}{4}$  inch.

This Elm and most of those growing at the Northern end of the Gardens were originally planted on mounds of earth evidently made specially for them, the idea being, no doubt, to relieve the naturally monotonous level of Kew. The one on which this elm stood has been planted with varieties of Japanese Cherries (*Prunus Lannesiana* and *P. serrulata*), many beautiful varieties of which have been introduced in recent years. A specimen of *Fagus sylvatica* var. *rotundifolia*, a distinct and attractive variety which originated at Knaphill, Woking, about 60 years ago, has been planted in the centre.

Early in the year, on February 10th and 11th, a storm brought down two large elms on the shaft yard side of the pond, and a third was so much injured by their fall that it had to be taken down also. They were not particularly fine trees, but their loss is to be regretted because they helped to shut out the view of the villas in the Kew Road from the Gardens. This is a matter of some concern, as it has always been an object steadily kept in view to block out as much as possible the sight of the houses which have sprung up in such great numbers during recent decades on this side of the Gardens. A group of Lombardy poplars planted on the site of the elms will, it is hoped, in a comparatively short time fulfil the purpose they did.

The border of shrubs extending from the Cumberland Gate to No. 1 Museum has been overhauled. For very many years past the front of this shrubbery has been occupied by a sloping bank of clipped laurel, the last representation in Kew of a use of the common laurel which, forty or fifty years ago, was very frequent in the Gardens as in other establishments. The pronounced success of the varieties of common Camellia (*C. japonica*) in the open air at



Kew suggested that a more extended use might be made of them here. Some sixty plants have therefore been collected and are now distributed along this shrubbery. Many of them are still quite small, but, if they succeed, they will eventually provide a distinctive feature. The one defect of the *Camellia* as a flowering shrub for the open air is the liability of its flowers to injury by late spring frosts. On this site the plants will at any rate be shielded from the rays of the morning sun.

HERBACEOUS GROUND.—The renovation of the beds devoted to plants arranged in their Natural Families has been continued. It consists of trenching the ground and replacing worn-out soil by fresh loam and fertilizers. Two more winter seasons' work will probably be required to complete this task, which was commenced in the autumn of 1926.

BIRDS.—The collection of ornamental waterfowl has been well maintained during the past year, but only among the geese were many young birds reared. Some thirteen Magellan or Upland geese and twelve Bar-headed geese were reared, and the majority were exchanged for other birds. A pair of Storks was presented by the Zoological Society, and Kew is also greatly indebted to Mr. W. H. St. Quintin of Scampston Hall, Yorkshire, for a pair of green-winged Teal (*Querquedula carolinensis*), a pair of American Redhead ducks, and four hybrid drakes between the American Wigeon male and Falcated Teal female. A pair of black East Indian ducks was presented by Mrs. Digby of Colchester. The retirement of the Bird-keeper, Mr. T. Raggett, who had been in charge of the birds for twenty-seven years, took place during the year, and as it was due to his intimate knowledge of the birds and their ways that our collections have been maintained at so high a level, his loss is much to be regretted.

ITEMS OF SPECIAL INTEREST.—Amongst interesting plants that have flowered during 1928 the following may be mentioned :—*Luculia Pinciana*, a species much rarer and less well-known than *L. gratissima*. Both are Himalayan, but *L. Pinciana* is well distinguished by five pairs of tubercles set in a circle near the throat of the corolla. It flowered in the Mexican section of the Temperate House during December and as that month was comparatively free from fogs the flowers remained in good condition for several weeks. This small tree is by no means a new one, for it was figured in the *Botanical Magazine* as long ago as 1845, but it seems never to have secured a permanent footing in gardens as *L. gratissima* has done. It is quite as beautiful as that species and the fragrance of the flowers is equally attractive.

*Baikiaea insignis*, the remarkable tree from Tropical West Africa, first flowered at Kew in July, 1914, and has done so on several occasions since, but never has it borne such a wealth of blossom as during 1928. It is grown in the Aroid House (No. 1)

near the Main Gate. The flowers are trumpet-shaped, up to eight inches long with a diameter of six inches, the broad petals being five in number, four white and one yellow. The tree was first found by Gustav Mann on the island of Fernando Po in 1863.

The flowering (and consequent loss) of a number of large Agaves during 1927 was noted in the preceding *Review*. Plants of *A. americana* and *A. Ixtli* flowered during 1928; the former can fairly easily be spared, but *A. Ixtli*, one of the Mexican fibre-producing species, is of more value.

A plant of *Thea* (*Camellia*) *speciosa* Pitard, raised from a cutting presented by Mr. J. C. Williams, flowered quite freely towards the end of the year. It is a native of Yunnan, China, and is an ever-green shrub with the leaves narrowly oval, very finely toothed, 2 to 3 inches long, 1 inch wide, and of a very dark green. The flower is 3 inches in diameter, the broad, emarginate petals being of a beautiful soft pink.

In the valuable collection of South African bulbs and seeds obtained through the kindness of Capt. Collingwood Ingram of Benenden Grange, Kent, perhaps the most interesting of the plants raised was *Monsonia speciosa* Sweet. It flowered during the autumn. The species was figured by Sweet in his *Geraniaceae*, vol. i. tab. 77, where he states that "this beautiful and distinct genus was named in the honour of Lady Anne Monson, a great promoter of Natural History and of botany in particular." The reappearance of this *Monsonia* is of especial interest, for it is difficult to say how long it is since the genus was represented in cultivation in this country; it can scarcely be less than one hundred years.

Another interesting plant raised from Capt. Ingram's seeds was *Kniphofia Galpinii* Baker; several plants produced their orange-coloured flowers during late summer. The species is quite new to cultivation.

An event unprecedented within living memory was the overflowing of the Thames on the night of January 6-7th, which resulted in the dwelling houses on the eastern side of Kew Green and the adjoining streets being flooded to a depth of several feet. The basement of the official residence of the Keeper of the Museums was flooded, but that was the only dwelling attached to the Gardens at all affected. The Herbarium cellars escaped by a few inches. A considerable area in the Queen's Cottage grounds was flooded but no real damage occurred.

A Sundial has been erected in the centre of the small medicinal garden at the east end of No. IV. Museum. It is chiefly of interest because the pedestal is formed of one of the stone balusters of Old Kew Bridge, which was demolished and replaced by the present one between 1899 and 1903. The baluster was presented by Mr. George Hubbard of Eltham, who resided at one time at Kew. The water-colour drawings of the Gardens made by his mother, which he has lent to Kew, are exhibited in Kew Palace (see *K.B.* 1927, p. 401).

The Fire Station in the Kew Road, close to the Curator's Office, was abandoned during 1928 by the Richmond Corporation. The ground on which it was built was lent by the Government, to whom it has now reverted. The building consisted of a shed and a stable which have been converted into store rooms, one of them for timber in process of preparation for the Museums Department.

The Flagstaff has received a protective dressing following a thorough scraping and filling up of crevices caused by the drying and shrinking of the wood. This treatment is given to prevent the entrance of moisture and is repeated every three years.

#### RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1928.

Inches.				Inches.			
January	...	...	2·97	July	...	...	2·34
February	...	...	1·95	August	...	...	2·72
March	...	...	1·82	September	...	...	0·97
April	...	...	1·33	October	...	...	3·85
May	...	...	1·92	November	...	...	1·90
June	...	...	2·32	December	...	...	2·35
Total 26·44 inches.							

The total for 1927 was 33·21 inches.

CONTRIBUTIONS TO GARDENS, 1928.—Acknowledgment has again to be made to Major Lionel de Rothschild for his great generosity to the establishment. During the past year he presented 156 packets of seeds collected by Capt. F. Kingdon Ward during his last expedition to the Far East, so that Kew has participated to a very full extent in the results of this enterprise without any cost to the public funds. Lord Bledisloe sent from his garden at Lydney Park, Gloucestershire, a very fine orange tree which has been placed in the North Octagon of the Temperate House. It is said to be about 250 years old. In April, two Mexican *Mamillarias*—*M. elegans* and *M. compressa*—were received from Mr. W. Hertrich of Huntingdon, San Marino, California. They are probably the finest examples of *Mamillaria* ever seen in this country. *M. elegans* consists of a clustered mass of about eighty stems and is eighteen inches in diameter; whilst *M. compressa* is even larger, being made up of over one hundred stems that form a compact mass twenty inches wide and one foot high. Both these plants were figured in the "Gardeners' Chronicle," July 7th, 1928, figures 3 and 4.

The Donard Nursery Co. presented over 3,000 bulbs of named daffodils for planting in grass.

Several consignments of rare and interesting succulent plants and bulbs have recently been received from Mr. J. Hutchinson, a member of the staff, who is making an official collecting tour in South Africa. Many of the succulents were collected in the Karroo desert and they include some interesting species of *Euphorbia*, *Crassula*, *Othonna* and

*Mesembryanthemum*. The bulbous plants include species of *Lachenalia*, *Babiana*, *Homeria* and several others unnamed.

During the year 911 separate consignments of living plants, seeds, etc., were contributed to the Gardens. This represents an increase of 61 on the number of contributions in 1927 and constitutes a record in the history of the establishment. The more important donations were as follows :—

*Public Institutions :—*

Aberdeen, Cruickshank Botanic Garden.—Plants including *Begonia* spp., *Sonerila Nisbetiana*, *Solanum Sanitwongsei*, etc.

Arnold Arboretum, Jamaica Plain, Mass., U.S.A.—Seeds of trees and shrubs.

Bangkok, Siam, Department of Agriculture.—*Musa* spp. and native varieties.

Belgrade Botanic Garden, Serbia.—35 packets of seeds.

Bermuda, Department of Agriculture.—Miscellaneous seeds and bulbs of *Lilium Harrisii*.

Bonn Botanic Gardens, Germany.—95 packets of seeds.

Buitenzorg Botanic Garden, Java.—130 packets of seeds ; plants of *Musa* spp., *Dendrobium* spp., and *Hydnophytum formicarum*.

Dar-es-Salaam, Tanganyika Territory, Department of Agriculture.—Plants and seeds, including *Adenium coactaneum*, *Thespesia macrophylla*, *Ixora* sp., etc.

Darjeeling, Lloyd Botanic Garden.—352 packets of seeds.

Darwin Botanic Gardens, Western Australia.—Seeds of *Pandanus Whitei*.

Dehra Dun, U.P., India, Forest Research Institute.—Miscellaneous seeds.

Dunedin Botanic Garden, New Zealand.—213 packets of seeds.

Edinburgh, Royal Botanic Garden.—74 packets of seeds, and plants of *Sarracenia* spp., *Ipomoea muricoides*, etc.

Glasnevin Botanic Gardens, Dublin.—A collection of *Sarracenia* spp.

Georgetown, Demerara, Department of Agriculture.—Fruits of *Lodoicea sechellarum*.

Hyde Park.—Collections of plants and seeds of bedding, greenhouse and decorative plants, and 116 packets of seeds collected in Nepal. Plants of *Primula reptans*, etc.

Imperial Institute, South Kensington.—Seeds of economic plants, including *Aleurites Fordii*.

Jamaica, Department of Agriculture.—Collection of Bromeliads, orchids and plants of *Agave Morrisii*.

Kirstenbosch, S. Africa, National Botanic Gardens.—Bulbs and seeds of South African plants.

Kuala Lumpur, F.M.S., Department of Agriculture.—*Musa* spp.

Lisbon Botanic Garden, Portugal.—42 packets of seeds, and tubers of *Oxalis cernua*.

Madagascar, Department of Agriculture.—A collection of orchids.

Majorca, Spanish Government Tree and Fruit Culture Station.—Grafts of four varieties of cultivated Almonds.

Maymyo, Burma, Government Botanic Gardens.—A collection of orchids.

Melbourne Botanic Gardens, Australia.—25 packets of seeds.

Missouri Botanic Gardens, St. Louis, U.S.A.—Nymphaeas.

Montpellier Botanic Gardens, France.—50 packets of seeds.

Munich Botanic Gardens, Bavaria.—Plants including *Sarracenia Courtii*, *Drynaria Fortunei*, *Photinopteris speciosa*, and *Platy-cerium* sp.

Nantes Botanic Gardens, France.—45 packets of seeds.

New Zealand (Nelson) Alpine and Rock Garden Society.—60 packets of seeds.

Peradeniya, Ceylon, Royal Botanic Gardens.—Seeds of *Corypha umbraculifera*.

Prague Botanic Gardens, Czechoslovakia.—Cuttings of *Ginkgo biloba* var. *pendula*.

Singapore Botanic Gardens, Straits Settlements.—Plants and seeds, including *Impatiens oncidoides*, *Heliconia aurea*, etc.

Taronga Zoo Park, Sydney, Australia.—Seeds of *Acacia Sophorae*.

Tokyo, Japan, Botanic Garden of the Imperial University.—46 packets of seeds.

Toulouse Botanic Gardens, France.—42 packets of seeds.

Trinidad, Department of Agriculture.—Seeds of *Musa* sp.

Utrecht Botanic Garden, Holland.—Plants of *Ceratopteris cornuta*, *Stenochlaena palustris* var. *scandens* and *Platy-cerium Wilhelminae-Reginae*.

Washington, U.S. Department of Agriculture. Seeds and plants, including *Melaleuca Websteri*, *Aristolochia grandiflora*, etc.

*Private donors :—*

Mr. A. Abbott, Sao Paulo, Brazil.—Plants of *Moquilea tomentosa*.

Rev. J. Farnworth Anderson, Leicester.—38 packets of seeds (*Celmisia* spp.).

Mr. F. R. S. Balfour, Dawyck.—Seeds, including *Nothofagus* sp.

Mr. A. C. Bartholomew, Reading.—Plants and seeds of Alpines.

Col. F. D. Bird, Melbourne.—Seeds of New Zealand and Australian plants.

Hon. David Bowes-Lyon.—25 *Larix eurolepis*.

Mr. N. E. Brown, Kew.—Seeds and plants of S. African succulents.

Mr. A. K. Bulley, Neston.—45 packets of seeds.

Mr. I. H. Burkill, Leatherhead.—Tubers of *Dioscorea* spp.

Mr. W. J. Burstow, Haywards Heath.—A collection of orchids.

Mr. H. Campbell, Kyrenia, Cyprus.—Miscellaneous seeds.

Mr. A. A. Cavanagh, Playadito, Argentine.—Seeds of *Ilex paraguensis*.

Mr. W. S. Chamberlain, Twickenham.—Seeds from South Africa.

- Mr. D. J. W. Chandler, Malvern, Melbourne, Australia.—Bulbs of *Lilium candidum*.
- Sir F. R. Chapman, Wellington, New Zealand.—Seeds, including *Alectryon excelsum*, *Entelea arborescens*.
- Hon. H. G. Chick, Shiraz, Persia.—Bulbs and seeds collected in Persia.
- Mrs. Collins, Sriracha, Siam.—Tubers of *Dioscorea* spp.
- Mr. W. G. Corbitt, Pacific Lumber Co., California.—North American tree seeds.
- Mr. W. Cradwick, Jamaica.—Seeds, and bulbs of *Bletia* sp.
- Miss A. Eastwood, San Francisco.—Miscellaneous seeds including *Arctostaphylos patula*.
- Mr. T. M. Endean, Laindon, Essex.—*Lithops Karas-montana* and *L. Schwantesii*.
- Professor R. R. Gates, King's College, London.—Seeds collected on the Mackenzie River Expedition, 1928.
- Mr. R. C. Bruce Gardner, Northwood, Middlesex.—Seeds of *Quercus* spp.
- Mr. C. S. Garnett, Derby.—A collection of orchids from the Amazon.
- Hon. Vicary Gibbs, Aldenham.—Seeds and plants.
- Mr. A. V. Giblin, Hobart, Tasmania.—Seeds, including *Drosera* spp.
- Dr. R. Guiseppi, Felixstowe.—A collection of bulbs and seeds.
- Mr. A. Haarer, Moshi, Tanganyika Territory.—Seeds, including *Begonia* spp., collected in Tanganyika Territory.
- Commendatore C. Hanbury, La Mortola, Italy.—65 packets of seeds.
- Mr. F. G. Hanbury, East Grinstead.—Trees, shrubs and herbaceous plants.
- Dr. A. Henry, Dublin.—Seeds of trees and shrubs.
- Miss A. E. Hill, Groendoorn, S.W. Africa.—Plants and seeds of succulents.
- Mr. E. M. Holmes, Sevenoaks.—Seeds of medicinal plants, including *Ephedra sinica*.
- Mr. C. W. von Hirschberg, Elizabethville, Belgian Congo.—Orchids, *Gladiolus* spp., etc.
- Capt. C. Ingram, Benenden, Kent.—Collections of plants, bulbs and seeds from S. Africa.
- Mr. Duncan S. Johnson, Johns Hopkins University, Baltimore.—Plants of *Leitneria floridana*.
- Mr. H. Johnson, Hynes, California.—Tubers of Nymphaeas.
- Capt. G. Garro-Jones, M.P.—Plants of *Hibiscus mutabilis*.
- Mr. C. C. Lacaita, Petworth.—Bulbs of *Scilla Paui*.
- Mr. C. H. Lankester, Cartago, Costa Rica.—Collections of Costa Rican orchids.
- Mr. A. E. Lawrance, Venezuela.—Miscellaneous seeds and orchids including *Epidendrum leucochilum*.

- Dr. F. Lemperg, Austria.—40 packets of seeds and herbaceous plants.
- Dr. J. P. Lotsy, Velp, Holland.—Cuttings of *Salix caprea* hybrids.
- Dr. R. Marloth, Cape Town.—Seeds of *Welwitschia mirabilis*.
- Mrs. Mason, Canterbury.—A collection of South African bulbs.
- Hon. H. D. McLaren, Bodnant, N. Wales.—Plants of *Watsonia Galpinii*, *Rhododendron* spp., *Lilium Brownii*, etc.
- Mr. R. Page, Singapore.—Plants of *Vanda* "Miss Joaquim" (*Vanda teres* x *V. Hookeriana*).
- Major Albert Pam, Broxbourne.—Bulbs from Peru.
- Mrs. N. E. Parry, Lushai Hills, Assam.—Miscellaneous seeds and a collection of orchids.
- Mr. G. Reuthe, Keston.—Miscellaneous plants, including *Rhododendron suave* and *R. Metternichii nanum*.
- Mr. G. Robinson, Vina del Mar, Chile.—A large collection of seeds, bulbs and tubers of terrestrial orchids.
- Hon. Mrs. Ryder, Beaulieu.—Seeds and bulbs of South African plants, and a fine specimen of *Protea compacta*.
- Messrs. Sanders, St. Albans.—Extra fine bulbs of *Lilium sulphureum*.
- Mr. A. G. Soames, Uckfield.—Seedlings of *Rhododendron Aucklandii* x *auriculatum*.
- Mrs. E. W. Sexton, Plymouth.—Plants of *Mesembryanthemum* spp. and seeds of *Lilium Glehnii*.
- Mr. T. Sharp, Westbury.—Succulents.
- The Rt. Hon. The Earl of Stair, Lochinch, Wigtownshire.—50 bulbs of *Lilium giganteum*.
- Major F. C. Stern, Goring-by-Sea.—Trees and shrubs and 24 packets of seeds.
- Mrs. R. C. J. Swinhoe, Maymyo.—A collection of Burmese orchids.
- Lt. Col. E. E. Todd, Herne, Kent.—Seeds of *Viola* spp. and *Argyroxiphium sandwicense*.
- Miss D. Ulbricht, Leytonstone.—Filmy ferns.
- Mr. F. A. Weinthal, Sydney, N.S.W.—A collection of terrestrial orchids.
- Dr. A. H. Williams, Horsham.—Seeds from New Zealand.
- Mr. P. D. Williams, Lanarth, Cornwall.—Seeds and plants, including *Enkianthus quinquefolius*.
- Miss M. Wilman, Kimberley.—Plants of Cape succulents.
- Mr. A. Worsley, Isleworth.—Bulbs and plants.
- Mr. K. Yashiroda, Japan.—Seeds, including *Lilium* spp., *Rhododendron Schlippenbachii*, etc.

DISTRIBUTION OF PLANTS AND SEEDS.—There were 163 recipients of seeds sent out from Kew, the total number of packets distributed being 8,881: hardy trees and shrubs, 3,311, herbaceous plants, 5,570.

The most important seeds specially distributed included :—species of *Sorghum* from Nyasaland, *Pennisetum typhoideum*, *Aleurites Fordii*, *Arachis hypogaea*, *Ranunculus Lyallii*, *Libocedrus Bidwillii*, *Tephrosia toxicaria*, *Schinopsis Balansae*, *Nothofagus fusca*, *Ilex paraguensis*, *Lilium* spp.

Wardian cases of plants were despatched to the Botanic Gardens, Cameroons and Peradeniya ; also to the Department of Agriculture, Trinidad, and the East African Agricultural Research Institute, Amani, Tanganyika Territory. Other overseas consignments of a fairly bulky nature were sent to the Department of Agriculture, Bermuda ; H.E. the Governor, Malta ; and the Lieutenant Governor, Northern Provinces, Nigeria.

Other recipients of plants, etc., from Kew, included the following : His Grace The Duke of Abercorn, Government House, Northern Ireland.—Collection of trees and shrubs.

Algiers, Directeur du Service botanique.—Seeds of *Fraxinus numidica*.

Basle Botanic Garden.—Greenhouse and stove plants.

H.M. King Boris of Bulgaria.—Collection of herbaceous plants, etc.

British Guiana, Department of Agriculture.—Plants of *Codiaeum* spp., and various seeds.

Budapest, University Botanic Garden.—*Nuttallia cerasiformis*, *Prinsepia utilis*, *Dichotomanthes tristaniaecarpa*.

Cambridge, Botanic Garden.—Plants and seeds.

Cambridge, Pembroke College.—Plant of *Populus trichocarpa*.

Cardiff Parks and Open Spaces Department.—Seeds of herbaceous plants.

Rev. A. R. Collins, Studland Rectory, Dorset.—Plants of *Rosa*, *Rubus* and *Vaccinium* spp.

Mr. W. Cradwick, Jamaica.—Plants including *Liriope*, *Fuchsia*, *Pelargonium* spp., also seeds of *Clanthus Dampieri*.

Cruickshank Botanic Garden, Aberdeen.—Plants of *Maranta arundinacea*.

Cyprus, Department of Agriculture.—Seeds of *Perilla nankingensis* and *Rhus pentaphylla*.

Monsieur L. A. Dode, Paris.—Grafts of *Saxegothea*, *Podocarpus*, *Fraxinus*, *Planera* and *Ulmus* spp.

Dunedin, New Zealand, Public Gardens.—Seeds of *Lilium* spp.

Edinburgh, Royal Botanic Gardens.—Seeds, greenhouse and stove plants, trees and shrubs.

Giza, Egypt, Horticultural Section of the Ministry of Agriculture.—Seeds of *Victoria regia*.

Hon. Vicary Gibbs, Aldenham.—Bulbs, cuttings, trees and shrubs.

Glasnevin Botanic Garden, Dublin.—Seeds and plants.

Dame Alice Godman, Horsham.—Trees and shrubs.

Messrs. Hillier & Sons, Winchester.—Seeds, cutting and plants.

Mr. G. Lindley Hinde, Kamrup, Assam.—Plants, varieties of *Rex Begonias*.



Mr. C. W. von Hirschberg, Belgian Congo.—Orchids.  
Hobart, Tasmania, His Worship The Mayor.—Plants of *Shakespeare's Mulberry*.  
Hyde Park.—Plants and seeds.  
Imperial Sugar Cane Station, S. India.—Sugar Cane cuttings.  
Italian Somaliland, Botanic Station.—Seeds of succulents.  
Leicester, University College.—Greenhouse and stove plants.  
London County Council (Parks Department).—Collection of greenhouse plants.  
London School of Hygiene and Tropical Medicine.—Plant of *Derris elliptica*.  
Manchester Parks and Cemeteries Department.—Plants.  
McMaster University, Toronto, Canada.—Plants of 12 species of *Anthurium*.  
Melbourne Botanic Gardens.—Seeds of *Primula* species, cuttings of Kew Rambler Rose and Cricket Bat Willow.  
Lt.-Col. L. Messel, Nymans, Handcross.—Plants, including *Manglietia insignis*.  
Missouri Botanical Garden, St. Louis.—Plants of *Nepenthes* spp., seeds of trees and shrubs.  
National Rose Society, 28, Victoria Street, S.W.1.—Plants and cuttings of *Rosa* spp.  
New York Botanical Garden.—Plants of *Hemerocallis* spp., cuttings of *Populus* spp.  
New York State Agricultural Experiment Station.—Seeds and cuttings of *Ribes* spp.  
Nottingham University, Department of Biology.—Cuttings and plants of *Cupressus* spp.  
Oxford, University Parks.—Trees and shrubs.  
Major Albert Pam, Broxbourne.—Plants and bulbs.  
Dr. V. B. Galeano, Legation for Paraguay, London.—Seeds of Rhododendrons.  
Pietermaritzburg Botanic Society.—Seeds of trees and shrubs.  
Division of Botany, Pretoria.—Peppermint plants, seeds, etc.  
Richmond Park.—Trees and shrubs.  
Rothamsted Experimental Station, Harpenden.—Seeds and plants of trees and shrubs.  
Major L. de Rothschild, Exbury.—Tubers and plants.  
Royal Botanic Society, Regent's Park.—Greenhouse and stove plants.  
Hon. Mrs. Ryder, Beaulieu.—Plants and seeds.  
Sandringham, Royal Gardens.—Greenhouse plants.  
Seychelles, Department of Agriculture.—Plants of *Mentha arvensis*, "Japanese Peppermint."  
The Rt. Hon. The Earl of Stair, Lochinch.—Plants and seeds.  
Major F. C. Stern, Goring-by-Sea.—Bulbs, seeds and plants.  
Swansea, Parks Department.—Seeds and economic plants.  
Trinidad, Department of Agriculture.—Seeds of *Eucalyptus* spp., also seeds and suckers of *Musa* spp.

Toronto University, Department of Botany.—Cuttings of *Salix cinerea* var. *Medemii*.

United States Department of Agriculture (Federal Horticultural Board).—Seeds and succulent plants.

Utrecht, Holland, Botanic Garden.—Plant of *Bryophyllum proliferum*, cuttings of *Salix cinerea* var. *Medemii*.

The usual distribution of surplus trees, shrubs and herbaceous plants to educational and public institutions was made in February.

### National Pinetum at Bedgebury.

The year 1928 was, on the whole, the most favourable of the last three years for the young trees at Bedgebury, although there were decided set-backs in several directions.

*Climatic effects on plants.*—The wet snow followed by frost and a subsequent rapid thaw, which occurred between Christmas Day, 1927, and New Year's Day, 1928, caused a number of losses amongst the more tender plants, and several species that had stood for two years were killed. A few of the deaths were *Araucaria brasiliiana*, *Juniperus procera*, *Widdringtonia cupressoides*, *W. juniperoides*, *W. dracomontana*, *Cunninghamia Konishii*, *Abies religiosa*, and several plants of *Cupressus Macnabiana*, whilst various species of *Podocarpus* were seriously injured. It is possible that some of these plants might prove hardier if they could escape severe cold long enough to enable them to become really well established.

Mild weather was experienced during March and early April, which resulted in early growth. Later, the mild weather gave place to cold winds and frosts extending over several weeks, which shrivelled up the young shoots of many of the European and Asiatic species of *Abies*, *Picea* and *Tsuga*. During this time young shoots of Sweet Chestnut, *Rhododendron ponticum* and the young fronds of Bracken were also killed. This is the third spring in succession that young shoots have been crippled, and the repeated checks have resulted in many plants becoming stunted, while some have been killed outright.

Some of the most seriously injured plants were :—*Abies Fabri*, *A. bracteata*, *A. cephalonica*, *A. pectinata* (small plants), *A. Faxoniana*, *A. holophylla*, *A. nephrolepis*, *A. Pindrow*, *A. recurvata*, *A. sachalinensis*, *A. squamata*, *A. Webbiana*, *Picea albertiana* and variety *conica*, *P. jezoensis*, *P. likiangensis*, *P. Morinda*, *P. Maximowiczii*, *P. Schrenkiana*, *P. Wilsonii*, *Tsuga Brunoniana*, *T. chinensis*, *T. diversifolia*, *T. yunnanensis*.

A good many interesting facts relating to susceptibility to injury by spring frosts, and recovery from the same, may be noted among the many species in cultivation at Bedgebury.

Amongst the new species of *Abies* the one that has withstood spring cold most satisfactorily is *A. koreana*. That species was scarcely injured owing to its starting into growth later than other

species. The N. American firs, *Abies nobilis*, *A. grandis*, *A. concolor*, *A. Lowiana*, *A. magnifica* and *A. amabilis* escaped injury, but *A. balsamea* and *A. bracteata* were badly cut.

Several of the newer species of *Picea* withstood the spring cold very well, notably *P. asperata*, *P. brachytyla* and its variety *purpurea*, and *P. morrisomicola*. Of the two species of *Sequoia*, *S. gigantea* appears to be less susceptible to injury by cold, in a young state, than *S. sempervirens*. The various Cedars have not been injured, neither has serious harm come to any of the Pseudotsugas. One Larch, *Larix Griffithii*, was injured by spring frost, but although all the others were in full leaf during the cold period, they escaped serious harm.

From the end of May onwards the climatic conditions were favourable for tree growth, and owing to the excellent root system of the young trees, some of those that had been injured by frost exhibited remarkable powers of recuperation, so much so that it is confidently expected that many of the injured plants will form new leading shoots during 1929 if spring frosts are not experienced. Several instances of recovery from frost injury are already very noticeable. An outstanding case is that of *Picea jezoensis* var. *hondoensis*. The variety was less severely cut than the type, but the young shoots were seriously checked. However, several trees have made a good recovery, forming leading shoots a foot or more long during summer. In fact one plant, 14.X.F., recovered from the 1927 cold and formed a leading shoot 17 inches long, whilst in 1928 the same plant added 25 inches to its height. Another plant of the same variety, 14.X.A., formed a leading shoot 19 inches long in 1928, after being badly frozen in May, 1927, and less severely frozen in May, 1928. The best plant of *P. jezoensis* is still struggling to live and has formed very little new growth since the May frost.

*Damage by wind.*—The Pinetum suffered severely from wind on November 16th, but entirely amongst the old trees. Altogether 30 trees were either blown down or broken off and they were not the most exposed trees. They were mostly in two groups and included 4 *Abies grandis*, 1 *A. nobilis*, 3 *Tsuga Albertiana*, 1 *Cupressus Lawsoniana*, 1 *C. thyoides*, 1 *Thuya plicata*, 2 *Pseudotsuga Douglasii*, 1 *Juniperus chinensis*, 4 *Pinus sylvestris*, 2 *P. Laricio* var. *nigricans*, 2 Oaks and 4 Hollies. The extent of the loss can be gathered from the fact that all were well-grown trees 60 years old and upwards. It was difficult to get exact measurements at the time, but one of the *Abies grandis* was approximately 85 feet in length and 8 feet 2 inches in girth about 7 feet from the base. The leading shoot made during the previous summer was 19 inches long. The other *Abies* and the Tsugas were very similar in size. The longest *A. grandis* measured was 95 feet. One of the Douglas firs was between 80 and 90 feet in length and the girth was 6 feet 5½ inches. The largest Scots Pine was 87 feet long. The position occupied by these trees was rather wet, the natural water level throughout a considerable part of the

year being 12 to 18 inches beneath the surface. The soil is loam overlying Kentish rag. It was interesting to notice the difference in root penetration in these different trees. Pines and Oaks were deeply rooted and were apparently more or less indifferent to the presence of a high water level or hard pan. *Abies*, *Tsuga*, *Thuya*, *Cupressus* and Douglas Fir on the other hand had failed to penetrate the pan and their roots had spread out over very wide areas above the water level. In all cases very wide masses of earth were torn up with the roots: in several instances these masses were 20 to 25 feet across and rarely more than 12 to 15 inches thick. The Hollies were well-grown old trees in a drier situation. The roots had penetrated the pan which in that area is 6 to 9 inches below the surface.

*Insect and fungus pests.*—Some injury was done to the American Spruces in March and early April by *Aphis abietina*, but it was kept in check by spraying. It would appear that this pest is likely to recur year by year and a sharp look out for infested plants in March will be very necessary. Species of *Dreyfusia* are present on some of the *Abies*. This again appears to demand critical attention. Pine weevils were not so noticeable as in the two previous years, the damage done being comparatively light. It is hoped that this pest may now disappear. Pine-shoot Tortrix moths are responsible for some damage. Here and there plants have been killed by *Armillaria mellea*, the fructifications of which have been prominent on old tree butts and on dead Araucarias in the Avenue near the farm.

*Progress of young trees.*—Trees that have escaped injury by frost or other agencies are making excellent progress, the Junipers, Thuyas, Cypresses, some of the Tsugas, Douglas Firs, Cedars and Larches being in very good condition. The policy of planting in well-prepared holes, with the pan broken, has been amply justified. Even trees that have been injured have developed an exceptionally good root system, which, in the event of a favourable spring, will materially assist the injured branches towards recovery.

The vigour of the Larches is particularly noticeable, and with the exception of *Larix Potaninii* and *L. Griffithii* they have grown well. It is interesting to compare the development of various species. As a rule *Larix leptolepis* develops more rapidly in a young state than *L. europaea*, but at Bedgebury the latter species has grown more rapidly than either the Japanese larch or the hybrid *L. eurolepis*. The most rapid growth of any tree planted at Bedgebury is that of *L. europaea* var. *polonica*, 10.X.D. This was planted on 21st March, 1925, and it was then 2 feet 6 inches high. Measured in March, 1928, it was found to be 13 feet 4 inches high, and though not accurately measured at the end of the growing season of 1928, it was then approximately 16 feet high, and heavily branched. The wide spacing of the trees has resulted in the production of many branches and a good deal of pruning will be necessary. So far the young larches do not show any signs of Larch Canker, although young trees in a plantation little more than 100 yards away are badly

cankered. Their present immunity is apparently due to hygienic conditions produced by wide spacing and thorough ground preparation. *L. occidentalis* is alone in developing meagre side branches.

*Natural regeneration.*—In previous numbers of the Bulletin it has been explained that the ground on which the Pinetum has been formed was partly Chestnut Coppice with Oak, Holly and Conifer standards and partly a wood of Scots Pine. Many of the Hollies and rarer Conifers were left. Since 1925 the practice has been followed of cutting down weeds throughout the area once or twice a year, and rabbits have been excluded, therefore seedling trees have had a chance to grow. This has resulted in an enormous crop of young Birch; about the Hollies a very heavy crop of seedling Hollies; in several places large numbers of seedling *Cupressus Lawsoniana*; Scots Pine seedlings almost everywhere (the forester at Bedgebury collected 13,000 two-year seedlings from the Pinetum last spring and planted them in his nursery for forest planting this winter); a small number of seedlings of *Thuya plicata*, *Pseudotsuga Douglasii* and *Picea sitchensis*, in addition to several other species.

The cutting of coarse weeds is allowing Ling (*Calluna vulgaris*) and Heather (*Erica cinerea*) to make progress in several directions, and here and there are considerable masses of Broom (*Cytisus scoparius*), which is being left for the present to provide a little shelter and to help in keeping down other weeds.

### The Museums.

GENERAL.—The congested state of the Museums makes the work of incorporation of new specimens difficult, and it is only by a judicious system of elimination of the older material that space can be found for new plant products. Such a system has very definite limits, owing to the Museums exhibits being complementary to other collections in the establishment. Series of plant products which have been presented by merchants, or by firms of manufacturers, in course of time become out of date, or deteriorate in colour and quality. In the interests of economic botany they must be retained, and an effort is being made to induce donors of special exhibits to renew them as occasion warrants.

The congestion in the Museums is felt in another direction. Owing to limited space, small specimens only can be shown. Such specimens are quite large enough for botanical purposes, but they are often inadequate to convey to the lay mind in proper perspective, an idea of the importance of certain products. In the interests of education and trade, it is desirable that imposing displays should be made of some of the more important products of plants.

Again, the successful exhibition of timber presents a difficult problem. From a botanical standpoint small specimens of wood are often sufficient, providing they are correctly named, but timber merchants and manufacturers want to see typical plank specimens in order that they may form an idea of the quality of the wood and

its probable use. For their purpose typical plank specimens 6 feet and upwards in length, and of the width of the tree, are required. An effort is being made, in the two Museums devoted to timbers, to remodel the collections with a view to giving prominence to commercial woods. At the same time collections of hand specimens of woods of various countries, not necessarily woods of commercial importance, are being built up for botanical purposes.

A direction in which the value of the Museums devoted to timber could be extended, would be in the exhibition of articles manufactured from the lesser known kinds of woods which the Colonies and Dominions would like to place upon the market. A commencement has been made in this direction by having seats for the accommodation of visitors manufactured from woods that are rarely used for such a purpose. However, to pursue such an object to the desired end would necessitate a good deal more floor space than is available.

ROUTINE WORK.—As usual a good deal of time has been spent in attending to correspondence and enquiries made at the Museums on economic products and subjects relating to plant cultivation.

Attention to labels, the incorporation of new specimens, and the removal of specimens in rooms given over to workmen, necessitated much work amongst the collections.

SPECIAL WORK.—Investigations were made concerning species and varieties of *Musa*, and with regard to two fibre plants recently brought to public notice. An Assistant has continued to devote part of his time to work on timber anatomy.

During the year several special exhibits were made in the Museums, and a permanent exhibit of Fodder Grasses has been arranged.

The Keeper has continued to act as Executive Officer for the Pinetum at Bedgebury.

PUBLICATIONS.—A new Guide has been published to the Collections in Museum No. II. Other publications by the Museum Staff include "The Banana in some Tropical Eastern Countries—its forms and variations" (*K.B.* 1928, p. 305); "Trees in Roads and Streets—their establishment and maintenance" (*Quarterly Journal of Forestry*, 1928, p. 19); "Trees for Parks, Streets and Roads" (published and distributed by the Institution of Municipal and County Engineers).

MAINTENANCE WORK.—H.M. Office of Works have redecorated portions of three Museums and the North Gallery, but a good deal of redecoration is still required.

In Museum No. II, one of the oldest buildings in the Gardens, an outbreak of dry rot occurred which necessitated the removal of several cases, floor boards and joists, the heating of a wall to destroy the fungus, and other work. Half the building had to be closed to the public for several months.

A commencement has been made with the repainting of the insides of the cases in Museum II. As far as can be ascertained it is over 50 years since these cases were last painted.

PRESENTATIONS TO MUSEUMS.—Mr. M. T. Dawe, Sierra Leone.—Photograph of branching specimen of the African Oil Palm. Also fruits of African Oil Palm.

Mr. R. C. Notcutt, Woodbridge.—Log of *Eucalyptus Gunni* grown in this country.

Mr. F. N. Howes, Kew.—Various economic plant products collected in Burma, Malaya and Siam.

Mr. Rudolf Block, New York.—Ten specimens of Brazilian Woods.

Conservator of Forests, Trinidad.—Twenty-six specimens of Trinidad Woods.

H. E. Phya Daruphan Petak, Royal Forest Department, Bangkok.—Collection of hand specimens of Siamese Woods.

Mr. A. W. Playne, Bedford.—Leaves and small sample of Assam Indigo (*Strobilanthes flaccidifolius*).

Sir Algernon Aspinall, C.M.G., C.B.E., West India Committee.—Sample of Megass from Sugar Cane refuse.

Mr. L. Palmer, London.—Specimens of Jedari (*Rhus oxyacantha*).

Messrs. John K. King & Sons, Coggeshall.—Specimens of British Fodder Grasses.

Dr. Carlos Moreira, Rio de Janeiro.—Seeds of *Moquilea tomentosa*.

Mr. T. Hay, Hyde Park.—Fruits of "Colombian Bramble" (*Rubus macrocarpus*).

Messrs. Knowles & Foster, London.—Specimens of the "Ouricury Palm" from Brazil.

Messrs. Joseph Terry & Sons, Ltd., London.—Fruits and Flowers of various forms of *Theobroma Cacao*.

Mr. G. N. Selous, British Consulate, Casablanca, Morocco.—Specimens of wood and berries of "Tizrah" (*Rhus pentaphylla*).

Messrs. Clarence Elliott, Ltd., Stevenage.—Burrs and galls of *Nothofagus* sp. from Tierra del Fuego.

Mr. E. Graham, Brisbane.—Twenty-one photographs illustrating Forestry, etc., in Queensland.

Miss M. M. Whiting, Blythburgh.—Seven sections of wood.

Dr. Jordan, Director of the Research Station of the Paint and Varnish Manufacturers' Association, Teddington.—Exhibit of Tung Oil and Perilla Seed Oil.

Chief Conservator of Forests, Pretoria.—Hand specimens of South African Woods.

British Legation, Athens.—Turkish Tobacco Seed, variety "Cavalla."

Mr. R. D. Oldham, Kew.—Photograph of the largest Cypress tree in India, growing at Deota, West Garhwal.

The British Drug Houses, Ltd., London.—Specimen of Ephedrine Hydrochloride.

Dr. G. H. Rodman, Putney.—Copies of radiographs of *Citrus* fruits, with the fruits from which the radiographs were prepared.

Mr. C. W. Kermode, Forest Botanist, Maymyo.—Collection of hand specimens of Burmese Woods.

Mrs. Collins, Sriracha, Siam.—Thirteen samples of Siamese varieties of Rice.

Captain E. Holland, Finchley.—Two specimens of Kauri Pine with Resin.

Mr. F. A. Stockdale, Peradeniya.—Two photographs of *Entada scandens*.

Sir Herbert Cook, Bt., Monserrate, Portugal.—Cone of *Araucaria Bidwillii*.

Mr. C. J. Trist, Provisional Forestry Board, Brisbane.—Twenty-four hand specimens of Queensland Woods.

Director, Department of Agriculture, Rhodesia.—Seven samples of Rhodesian Fodder Grasses.

Major R. H. Thomas, c/o Casa Tagua, Esmeraldas, Ecuador.—Collection of small specimens of Central American Woods.

Mr. S. Kessell, Conservator of Forests, Perth, W. Australia.—Three photographs of Jarrah and Karri Forests.

Mr. W. R. Price, London.—Samples of textile made from fibre of *Musa loochoensis* in the Loochoo Islands.

Miss M. S. Johnston, Kew.—Picture of *Tibouchina*, painted by a Chinese artist on Rice Paper.

### The Jodrell Laboratory.

The varied material examined microscopically for purposes of identification included a large proportion of samples of wood (commercial timbers, etc.). A few of the items dealt with were as follows :—two collections of ancient specimens (wood, leaves, fruits, etc.) from Egypt ; some archaeological specimens of wood from Transjordan and Palestine ; several Chinese drugs from a large series being dealt with by Dr. D. Hooper ; parts of plants used as remedies for snake-bite ; pollen taken from honey, and a sample of rope which proved to consist of a mixture of Manila Hemp and an *Agave* fibre. A further study of some developmental stages of the ovule of *Typhonodorum Lindleyanum* was made in collaboration with the Director, and observations were begun on the silica-bodies in the tissues of some Monocotyledons.

Miss E. Lyall carried out a series of experiments on the use of different fumigants as a means of controlling White Fly (*Aleurodes vaporariorum*) and Leaf Hopper (*Zygina parvula*) in greenhouses.

Miss I. Manton prepared material of the roots of about forty species of *Cruciferae* for cytological work, and studied the morphology of the chromosomes in this material.

Dr. G. H. Rodman examined a number of plants attacked by White Fly and by the Leaf Hopper, and made observations on the life-history of these two insects.



Mr. W. C. Worsdell completed his investigation on the anatomy of fasciated and normal plants of *Campanula carpatica*, begun in 1926 on behalf of the John Innes Horticultural Institution, Merton.

Members of the Herbarium Staff prepared and examined cultures of a number of Fungi, the determination of which was required, and also carried out some work on *Heteropatella Dianthi* (attacking carnations), and on a die-back disease of *Rhododendron*, in connection with researches on these subjects (see p. 38).

### The Herbarium.

A considerable portion of the second part of the cabinet extension programme, namely, the provision of an extra tier of cabinets above the existing blocks on the ground and first floors, was carried into effect in 1928. Extra tiers were supplied on the ground floor of the west wing and on the ground and first floors of the north wing, with the exception in both wings of the end walls. The additional space thus afforded permitted the adjustment of crowded material and the incorporation of a vast number of sheets which had been temporarily stored.

Highly satisfactory progress was made with the old collections in the Store. Not only were some 30,000 sheets laid in, but about 15,000 were dispatched as duplicates to various other herbaria. As far as flowering plants are concerned, practically only a few of the very large collections of the old material of long standing remain to be mounted. The constant influx of new material which has to be accommodated in the Store no longer permits the possibility of treating the old Store material separately. Some of the recent material requires early attention, hence the Store mounters have to be employed in dealing with both old and comparatively recent collections. As the amount of incoming material has increased during recent years the total decrease in the amount of material in the Store is not so rapid as was estimated when the Store staff was originally appointed.

The increase in the number of graduate students and research workers from Universities and Institutions who visit the Herbarium or come for periods of study is worthy of comment, since it indicates a closer co-operation between workers in various branches of Botany. The number of botanists from abroad and various parts of the Empire who visit Kew in connection with taxonomic and floristic investigation is likewise a source of satisfaction, even though it often necessarily involves the staff in much extra work. Such co-operation is highly desirable, being of great value to Kew and to botany as a whole.

Mention of publications by members of the staff and visiting botanists will be found under the respective geographical headings, but reference may be made here to the following important volumes which appeared during the year. Part 2 of Vol. I of the Flora of West Tropical Africa, by Mr. J. Hutchinson and Dr. J. M. Dalziel,

was published in July and carries the Flora as far as the family Umbelliferae. Advance copies of the volume by Mr. W. B. Turrill entitled " Plant Life of the Balkan Peninsula " (for which the degree of D.Sc. of London University was conferred) were received in the autumn. A notice of this work, which will be invaluable to students of any branch of botany in the Balkan Peninsula, will appear in an early number of the *Kew Bulletin*.

EUROPE AND THE ORIENT.—*Routine*.—The work of the Store has been pushed forward as far as possible and more than half of the large Churchill Herbarium has now been dealt with. Attention has also been paid to recent collections and these have not been allowed to accumulate. In all approximately 9,000 sheets of newly mounted material have been incorporated in the Herbarium, whilst about 20,000 sheets have been sorted into families and temporarily arranged in cabinets in the cellars. As room and labour become available they are being transferred to their proper places in the general collection.

The writing up of genera according to recent monographs and standard floras has been continued. Genera dealt with this year include :—*Euphrasia*, *Bartsia*, *Saxifraga* (in progress), *Campanula*, *Hypochaeris*, *Leontodon*, *Onopordon*, *Sisymbrium* and *Trigonella*, the latter having been examined and revised by Dr. Schirjaev of the Masaryk University, Brno.

Considerable additions were made to the British collections. 540 specimens from the herbarium of the late L. A. M. Riley were presented by Mrs. Riley. Mr. J. Gladstone handed over another set of plants from the outlying islands of Scotland, this year from the lonely island of Foula. An account of this collection is being prepared for publication. Mr. W. R. Price also visited the North Shetlands last season and an interesting series of specimens was received from him. Mr. E. Thurston added to the many Cornish plants he has already given to the Herbarium and also forwarded to Kew a considerable amount of miscellaneous and useful material. As in previous years, Mr. J. E. Little presented many interesting British plants and over 2,000 sheets were contributed by various members of the Kew Staff.

The late Rev. E. Ellman again kindly invited Mr. N. Y. Sandwith to accompany him to the south-east corner of Spain for a month's collecting in April and May, with the result that specimens of some 380 species have been named and incorporated in the Herbarium. Another addition to the Spanish collections in the Herbarium was an exceedingly valuable set of 185 new or rare species received as a donation from Mr. C. C. Lacaita.

Further supplies from the Balkan Peninsula were received during the year which have assisted in rendering the Kew collections exceptionally rich.

From Palestine contributions were received from the Department of Agriculture, Forests and Fisheries, Jerusalem, in continuation

of previous collections. Of especial interest were a large number of *Calendulae* and an extensive series of grasses, and also plants from the Dead Sea area. A collection of some 400 plants made by Miss M. E. Edmonds, largely from Palestine, was received for naming, and this included many species poorly represented in the Herbarium.

Another Orient collection of interest was sent on loan for naming. This was a small set of plants from Ur, Chaldea. It formed part of the collections made by Dr. Leon Legrain on behalf of the British Museum (Natural History) and the University of Pennsylvania, and contained a new species of *Centaurea*.

Mr. B. Gilliat-Smith, H.M. Consul at Tabriz, has continued his valuable contributions from Azerbidjan. A marked feature of his collections has been the number of species, described by Boissier, Bornmüller, Grossheim and other botanists, not hitherto represented at Kew, or represented by very imperfect material. There is no need to emphasize the value of filling in gaps with excellent material, often from type localities. Further supplies of Persian plants have also been received from Mr. H. G. Chick, H.M. Consul at Shiraz, and from Mr. H. F. MacMillan, who brought home 356 specimens on his return from Abadan.

(See also under Experimental Work, p. 42).

*Research and Publications.*—The Plant Life of the Balkan Peninsula (Oxford, Clarendon Press).

Researches on *Silene maritima* and *S. vulgaris*: I. (*K.B.* 1928, p. 1).

New Plants from Spain (*K.B.* 1928, p. 150).

The Flora of St. Kilda (Botanical Exchange Club Report, 1928, p. 428).

*Althaea setosa* Boiss. (Gard. Chron. Sept. 1928, p. 167).

Balkan Peninsula species of *Veronica* (Bull. Soc. Bot. Bulg. II. 1928, p. 19).

The Teaching of Evolution and Heredity in Schools (The School Science Review, No. 36, 1928. Abstract of a Lecture given at Kew).

ASIA: INDO-MALAYAN REGION.—*Routine.*—The Store has now been completely cleared of Indian material, and the following series having been named and mounted were laid in during the year:—Dr. W. J. Treutler's collection from North Bengal (including Sikkim Himalaya), 534 sheets; Mr. A. Meebold's collection, the fruits of a journey in Manipur, the Naga Hills and Burma, received in 1909, 640 sheets; Dr. J. J. Wood's collection from Bihar and Orissa, 933 sheets; Sir Harold Deane's collection, 292 sheets, and also several other small outstanding lots.

Of material received during 1928, some of the most important was from Mrs. A. D. Parry, who sent a final instalment of her collections made in a little-known area of the Lushai Hills in Assam; Mr. C. E. Parkinson, Forest Botanist, Burma, who sent a fairly

extensive series of trees and plants mainly from Tenasserim ; Mr. A. H. G. Alston, Systematic Botanist, Ceylon, who forwarded a number of critical Ceylon plants ; Professor R. R. Stewart, Gordon College, Punjab, who sent a further instalment of the extensive series of Kashmir plants already presented to Kew, and Mr. B. B. Osmaston, who sent an interesting collection from the same area. Several parcels were received from Captain F. Kingdon Ward, representing the first instalment of the collections made on his 1928 expedition to Manipur, the Naga Hills and the Dihang Valley of Assam.

Mr. H. H. Haines generously presented his Herbarium of about 7,000 sheets during the year. The collection is mainly from Bihar and Orissa, an area formerly not well represented in the Herbarium, while a number of the plants are from the Central Provinces and the Western Duars of N. Bengal, both regions from which comparatively little material has been collected. There are over 500 specimens from Sikkim and a number from the United Provinces as well as from Burma. The collection contains several type specimens, and the authentic specimens of Mr. Haines's species and varieties recorded in the "Flora of Bihar and Orissa." Of the total number of some 7,000 sheets comprising the Herbarium, 4,659 have been incorporated in the Herbarium at Kew. Of the duplicates a set of 1,258 sheets has been presented to the Botanical Department of the University of Aberdeen.

Dr. A. F. G. Kerr has continued to forward large consignments of plants from Siam. Nearly 3,000 were received during 1928, mainly from the Peninsular portion of Siam, including the circles from Rachburi to Pattain and Paker. Interesting Siamese specimens were also received from Mrs. D. J. Collins. A set of about 200 named plants from Hue and the vicinity, collected by R. W. Squires, was presented by Dr. E. D. Merrill. As in previous years, Kew is greatly indebted to Professor W. G. Craib for identifying the extensive collections received from Siam.

Material for identification was as usual forwarded from the Director of the Botanic Gardens, Singapore, and a donation of 1,027 named duplicates from Borneo and Java was received from the Director of the Botanic Gardens, Buitenzorg.

*Research and Publications.*—Part viii of the Flora of the Presidency of Madras, comprising the families from *Ulmaceae* to *Xyridaceae* (in the order of the *Genera Plantarum*), was published during the year and further progress towards Part ix has been made.

The following papers appeared :—"Contributions to the Flora of Burma," Parts v and vi (*K.B.* 1928, pp. 42, 332), with the descriptions of 3 new species.

"Contributions to the Flora of Siam," by Professor W. G. Craib and Miss E. T. Geddes, Additamenta xxiv and xxv (*K.B.* 1928, pp. 62, 234), including in all the descriptions of 46 new species.

"*Amomum muricatum*" (*K.B.* 1928, p. 105).

“Malayan Magnolieae,” by J. E. Dandy (*K.B.* 1928, p. 183), containing 12 new species, 6 new varieties and 2 new combinations.

CHINA AND NORTHERN ASIA.—*Routine*.—With the addition of a number of cabinets during the year, it has been possible to lay in about 6,800 sheets, which for lack of space had to be held over in the previous year. The labels on some 2,000 specimens of Mr. George Forrest's collecting, presented by the Royal Botanic Garden, Edinburgh, have been written up from his lists.

The Chinese material of *Polygonum*, *Rumex* and *Rheum*, which was sent on loan to Dr. Samuelsson, of Stockholm, and that of *Pilea* and *Lysimachia*, sent to Dr. Handel-Mazzetti, was on return re-arranged and incorporated according to the revised determinations. Several genera, notably *Corylus*, *Fraxinus*, *Ligustrum*, *Osmanthus*, *Styrax* and *Syringa*, of which monographs or revisions have recently been published, have also been written up and arranged accordingly.

Further progress has been made with the identification of the large collections made by Père Licent in Northern China and Mongolia. A number of Chinese flowering plants and cryptogams were received during the year, the largest consignment being a set of named duplicates from the National South-Eastern University, Nanking.

A considerable amount of cultivated material belonging to a number of critical genera has been named and studies have been continued on *Cotoneaster*. An investigation on certain species of *Sambucus* has also been commenced.

*Research and Publications*.—Work has been continued on the revision of the Old World species of *Buddleja* and the MS. is now ready for publication.

The publication of the proposed monograph of the Asiatic species of *Gentiana* and *Crawfordia*, referred to last year, has been delayed awaiting the loan of certain type specimens from abroad.

A paper entitled “New Asiatic Gentians” (*K.B.* 1928, p. 49), and another by the late Herr W. Becker, entitled “New Chinese species of *Viola*” (*K.B.* 1928, p. 247), have been published.

AFRICA.—*Routine*.—The routine work during the year has proceeded satisfactorily; some 10,000 specimens have been mounted, of which about 6,200 have been incorporated. With the exception of the very large collection of Mr. N. W. Thomas from Sierra Leone, all the old material in the Store has been cleared. The Thomas collection is being sorted into families and the specimens are being named concurrently with other material as the work on the “Flora of West Tropical Africa” proceeds, and duplicates are being set aside for distribution.

Work on the re-arrangement of the genus covers has been continued; many of the larger genera (such as *Clerodendron*, *Combretum*, *Cyperus*, *Grewia*, *Indigofera*, *Oldenlandia*) have been sorted

and divided up according to the five geographical divisions proposed for the Regional Floras of Africa.

With few exceptions current collections from the tropical African colonies received during the year have been determined, and lists of the identifications supplied. The largest from West Africa was forwarded from the Gold Coast by Sir A. Kitson, Director of the Geological Survey. Valuable material from the Gold Coast was also received from Messrs. T. Lloyd Williams, F. R. Irvine, C. Vigne and F. C. Deighton. From East Africa collections were received from Kenya Colony (H. M. Gardner, J. McDonald and W. Lyne Watt), Tanganyika Territory (A. E. Haarer, B. D. Burt), and Rhodesia (F. Eyles). The bulk of the East African material was from Tanganyika Territory, the collections of Mr. Haarer and of Mr. Burt, of the Game Preservation Department, being particularly large and containing several new species and species new to East Africa.

A considerable amount of work was carried out on tropical African grasses, over 1,120 specimens from various parts of Africa having been named, including collections from areas previously unrepresented in the Herbarium. Amongst the most interesting were sets from Sierra Leone (F. C. Deighton), Cameroons (T. D. Maitland), Kenya Colony (J. McDonald) and Mt. Elgon (J. D. Snowden), whilst from Tanganyika Territory valuable material was included in the collections mentioned above. Mr. Haarer's specimens were exceptionally interesting, since many of the specimens were from Pare District.

From South Africa the principal addition was a set from the Orange Free State collected and presented by Mr. C. A. Smith. In connection with a special study of the genus *Sorghum*, and in response to enquiries, several collections of this genus were received, notably from Tanganyika Territory, Uganda, Nyasaland, Basutoland, and a very large series from the Sudan.

The Assistant for South Africa was concerned largely with naming and laying in batches of specimens received from the National Herbarium, Pretoria, the Albany Museum, Grahamstown, from Professor C. E. Moss, the Rev. F. A. Rogers, and his own collections from the Fauresmith Division. An enquiry as to the disease of cattle known as "dun-siekte" led to the critical study of all the South African species of *Senecio* (§*Paucifolii*), as this genus was concerned in the poisoning which preceded the disease.

*Research and Publications.*—Practically the whole of Mr. Hutchinson's time in the first half of the year, before his departure for South Africa on a collecting tour, was taken up in preparing for the press Part 2 of the Flora of West Tropical Africa, which was eventually published in July. This contains the remaining families of the Archichlamydeae (Sterculiaceae-Umbelliferae) and deals with many genera of great economic importance.

The MS. of the "Enumeration of Species of the Flora of the Seychelles Archipelago" to be published by the Percy Sladen Trustees

has been completed, and the Essay to accompany it has been commenced. Descriptions of new species and some new combinations have been published (*K.B.* 1928, p. 388).

The following papers have appeared during the year :—" Notes on African Grasses," parts vi and vii, by C. E. Hubbard (*K.B.* 1928, pp. 35 and 130), a continuation of the series commenced in 1926, and including descriptions of 9 new species.

" The Genus *Dichapetalum* in East, South Tropical and Sub-tropical Africa," by M. B. Moss (*K.B.* 1928, p. 115).

Descriptions of new species discovered and new combinations made during the course of the work on the Flora of West Tropical Africa were published under the heading " Tropical African Plants," parts ii-vi, by J. Hutchinson and J. M. Dalziel, in various numbers of the *Kew Bulletin*.

" Notes on the Forest Flora of South Central Africa," by P. J. Greenway (*K.B.* 1928, p. 193).

Progress has been made with regard to the Part of the Flora of Tropical Africa dealing with grasses. The account of the genus *Setaria* has been revised and prepared for publication, the number of species contained having been increased from about 40 to 74. The whole of the genus *Rhynchelytrum* has also been revised and other genera are in course of preparation.

The Assistant for South Africa was engaged on the preparation of a Flora of the Fauresmith Division, this involving the provision of a systematic list, the analysis of the flora and the mapping of the plant associations and communities. Before this work could be accomplished it was found necessary to revise the South African material of several genera. *Pterothrix*, *Ampliglossa*, *Ifloga* and *Trichogyne* have been thus dealt with, and the revisions will be included in the Flora of Fauresmith when published. In the case of *Salsola*, about 250 sheets were borrowed from Continental herbaria, and a paper has been prepared which will be published separately. Revisions of the genera *Cissus* and *Rhoicissus* will be published in the same way.

AMERICA.—*Routine*.—Progress in the work on material in the Store has been so satisfactory that most of the older collections have now been mounted and prepared for incorporation or naming, although a long time must elapse before complete identification will be possible. These collections include those of M. E. Peck and C. H. Lankester from Central America, that of W. C. Fishlock from Dominica and the Virgin Isles, and the valuable sets of Brazilian species collected by Ule, Usteri and Robert. Further progress was made with the work of naming and distributing the Lehmann collection, and the Monocotyledons have at length been reached. A few hundreds of the vast mounted collection of Hassler's plants from Paraguay were named and laid in. Among the American genera which were rearranged last year in accordance with the most

recent monographs were *Erythroxylum*, *Haplopappus*, *Chrysothamnus*, *Bejaria* and *Stachytarpheta*.

Of recent additions many plants from various parts of South America have been named and incorporated, such as those collected by Miss G. Dorrien Smith and Mr. C. L. Collenette in Matto Grosso, and in lesser quantity by Mr. Clarence Elliott and Dr. W. Balfour Gourlay in Chile, by Mrs. Blake in Patagonia, and by Mr. B. G. C. Bolland in Ceará.

Amongst interesting new collections received during 1928 must be mentioned a very fine set of Greenland plants presented by Mr. C. G. Trapnell on behalf of the Oxford Expedition to Greenland, and another collection made chiefly in the Mackenzie River district by Professor R. R. Gates and Mr. K. Mellanby.

A considerable amount of time last year was devoted to the investigation of the flora of the British possessions in America and the West Indies. Large collections made in British Guiana by Mr. L. S. Hohenkirk and other forest officers, and also by Mr. R. A. Altson, lately Government Botanist in that Colony, were for the most part identified. A small collection made by Mr. H. C. Sampson during his recent visit to British Honduras was also dealt with.

*Research and Publications.*—The important work of checking the MS. of the Flora of Trinidad and Tobago, which is now being issued in parts by the Department of Agriculture, Trinidad and Tobago, occupied Mr. Sandwith's spare time, and in connection with the Flora many specimens have been received from Mr. R. O. Williams, who has also kindly furnished material of numerous Trinidad species, which were previously unrepresented from that Colony in the Herbarium.

A number of very striking novelties from British Guiana were published in a paper entitled "New Species from British Guiana" (*K.B.* 1928, p. 365). A review of the Section *Orcheosanthus* of *Pinguicula*, which occurs in Mexico and Guatemala, appeared in a paper entitled "The Orchid-flowered Butterworts" (*K.B.* 1928, p. 230). An amaryllidaceous plant collected in Peru was identified with a species described and figured as long ago as 1725, and later placed in the genera *Pyrolirion* and *Zephyranthes* by Herbert and Baker; it was decided, however, that the species is actually a member of the North American genus *Cooperia*, and the new combination, with emended description, was published in a paper entitled "Discovery of the genus *Cooperia* in Peru" (*K.B.* 1928, p. 385). The late Herr Wilhelm Becker published an enumeration (including descriptions of many new species) of the violets gathered by Dr. A. W. Hill in Peru and Bolivia, and by Mr. H. F. Comber in the Andes of Argentina (*K.B.* 1928, p. 133). Other new plants described during the year included further novelties discovered in the Argentine Andes by Mr. H. F. Comber (*K.B.* 1928, p. 107); new species of *Nototriche* and *Malvastrum* detected in a series recently collected by Dr. Werdermann in Chile (*K.B.* 1928, p. 17);



"*Diacrodon*, a new genus of Rubiaceae from Brazil" (*K.B.* 1928, p. 32), a plant found by Mr. B. G. C. Bolland in the State of Ceará.

AUSTRALIA.—*Routine*.—Work was continued on re-arranging and writing up the Australian material in the Herbarium, the families from Compositae to Euphorbiaceae being now completed. There has been an increase of material for naming, partly as a result of the Director's visit, especially from Tasmania, Western Australia, New South Wales and Queensland, and material of critical groups from Sydney and Melbourne (*e.g.*, *Potamogeton*, *Wahlenbergia* and *Mela-leuca*).

Queries with regard to New Guinea have been numerous, and have led to a good deal of critical work. Particularly difficult is the determination of the large number of Papuan Figs collected by Brass and forwarded by Mr. C. T. White. Altogether 1,100 sheets from this area have been laid in.

*Research and Publications*.—The revision of the Australian Frankenias has been finished and is now in the hands of the Linnean Society for publication. A revision of the Asperulae of Australia was published by H. K. A. Shaw and W. B. Turrill (*K.B.* 1928, p. 81), and a paper on the Australian genus *Astrebla*, or Mitchell Grasses, by C. E. Hubbard (*K.B.* 1928, p. 257).

NEW ZEALAND.—*Routine*.—Critical points of taxonomy and also of nomenclature have constituted the main work in connection with New Zealand. Interesting specimens of *Hebe*, *Myrtus*, *Coprosma* and *Dracophyllum*, and several very valuable series of natural hybrids of *Gaultheria*, have been received from Dr. L. Cockayne and Dr. H. H. Allan, and these, together with a number brought back by Dr. A. W. Hill, have been examined and for the most part laid in.

*Research and Publications*.—A paper entitled "A new species of *Lilaeopsis* from New Zealand" was published (*K.B.* 1928, p. 266).

POLYNESIA.—*Routine*.—Time has only permitted of answering routine questions and naming small collections. A large collection of Fiji plants was received from Mrs. B. H. Tothill, as well as further instalments from Mr. W. Greenwood. An interesting series of specimens mostly of trees was forwarded by Mr. J. H. L. Waterhouse from the British Solomon Islands, but owing to their being mostly barren only a small proportion of exact determinations could be made. 850 sheets of Fiji plants were laid in and the families Goodeniaceae-Restionaceae were written up and provided with new covers.

*Research and Publications*.—A paper entitled "Notes on New Caledonian Orchids," by Dr. F. Kraenzlin, was published (*K.B.* 1928, p. 34).

FERNS, MOSSES AND HEPATICAE.—The writing up of the ferns according to Christensen's Index Filicum has been continued, and

the provision of additional cabinets has made it possible to arrange some of these in their new systematic order. About 8,000 sheets have been laid into the collection during the year, of which some 2,000 were presented by Fleet-Surgeon C. G. Matthew, R.N., who had collected them while serving on the China Station, in Japan, China, Philippines, Sumatra, etc. This is a valuable acquisition, for not only have the specimens been well prepared, but many of them are provided with rhizomes, a feature of great systematic importance too frequently lacking in herbarium specimens. Most have been named by Mr. Matthew himself, and some also have been noted by Japanese and Philippine pteridologists. The numerous ferns from the Indian herbarium of Mr. H. H. Haines have also been incorporated.

Amongst the arrears dealt with have been those from Col. Beddome (India), Dr. W. J. Treutler (Sikkim), Professor R. H. Yapp (Malay Peninsula), Mr. W. Hancock (China and Formosa), Mr. F. W. H. Migeod (Cameroons), and Dr. E. Hassler (Paraguay).

The ferns from most of the collections received during the year have been named; amongst these were specimens from Dr. A. F. G. Kerr (Siam), Mr. L. Gibbs (China), Dr. Harold D. Brown (Szechuan), Mrs. Parry (Lushai Hills), Capt. F. Kingdon Ward (Naga Hills), Sir Albert Kitson (Gold Coast), Mr. F. Eyles (Rhodesia), Mr. H. Carse (New Zealand), and Mr. B. G. C. Bolland (Brazil).

The collection made in Melanesia by Bishop J. C. Patteson (who was murdered in 1871), was named for and returned to St. Augustine's College, Canterbury. Unfortunately the value of these specimens is much reduced owing to the absence of any indication of the definite localities where they were collected.

About 800 Mosses and Hepatics have been incorporated during the year, chief amongst them being Dr. A. F. G. Kerr's Siamese and Professor Handel-Mazzetti's Chinese collections. Further work has been performed in separating out some of the more recently described genera. A set of Mr. W. R. Sherrin's Sphagnaceae has been purchased and incorporated.

FUNGI, ALGAE, LICHENS.—*Routine*.—Numerous miscellaneous enquiries have been dealt with, some of a fairly simple nature, such as the identification of British Fungi and examination of type specimens for workers abroad, whilst others involved considerable time and research into matters of taxonomy and nomenclature. Assistance in such matters has been supplied to the Ministry of Agriculture and Fisheries' Pathological Laboratory at Harpenden, to the Advisory Officers under the Ministry's Advisory Service and to research workers both at home and abroad.

Enquiries of economic importance concerned the distribution of ergot in rye and ergotin in rye flour in connection with an outbreak of poisoning in Lancashire due to the use of rye bread, the identification of fungi in connection with medical research, and examination

and advice with regard to plant diseases, especially of ornamental plants.

In the early part of the year considerable time was again given to nomenclature and other matters in connection with the List of Popular Names of Plant Diseases, prepared by the Plant Pathology Sub-committee of the British Mycological Society and, as mentioned last year, recommended by the Imperial Agriculture Research Conference.

Among collections received and named during the year are included Fungi from Uganda (Hansford), Borneo and Malay (R. E. Holttum), Siam (A. F. G. Kerr, Mrs. D. J. Collins), India (R. N. Parker), Australia (J. B. Cleland), Greenland (Oxford University Expedition), in addition to numerous miscellaneous specimens from other correspondents.

Following on the addition of an upper tier of cabinets on the ground floor, the whole of the Fungi have been moved, and the opportunity was taken to re-arrange the Myxomycetes according to the latest edition of Miss G. Lister's Monograph, and at the same time to lay in several years' accumulation of specimens.

Material was received from Ireland and Scotland of a new disease of the Asiatic species of *Meconopsis*. It was found to be due to the fungus *Peronospora arborescens* and enquiries were instituted as to its incidence and severity in the British Isles. The Keeper attended meetings at the Forestry Commission with reference to Dutch Elm Disease and observations on Elm trees were conducted during the season. A copy of the working list of diseases of trees in Britain, prepared at Kew, was forwarded to the Commission.

A few small collections of Algae and Lichens have been received during the year and most of these have been named and incorporated.

As in previous years Mr. R. Paulson has generously given assistance with regard to the determination of lichens, and he kindly named an interesting and difficult set of specimens from the dry laterite soil of the Koonamore Reserve, S. Australia, collected at the request of the Director when he visited this Reserve with Professor T. G. B. Osborn.

*Research and Publications.*—Further work has been carried out on the fungus causing Leaf Rot of Carnations, and a short paper has been prepared for publication. A note with additional evidence as to the connection between *Rhizoctonia Crocorum* and *Helicobasidium purpureum* is also in the press.

An investigation on a die-back of Rhododendrons, distinct from the vascular disease mentioned below, is still in progress, but the parasitism of the fungus involved in this case is doubtful and appears to be dependent on the presence of certain unfavourable conditions.

A vascular disease of seedling Rhododendrons has continued to cause losses in the Arboretum Nursery, and Mr. C. J. A. Berkeley, of

the Imperial College of Science, continued his investigation of the fungi present, a species of *Ramularia* being apparently parasitic and responsible for the death of the plants.

**SUMMARY.**—The following table summarises the routine work, apart from naming, accomplished by the regular staff and by the special Store staff during 1928, excluding the lower cryptogams.

Mounted	...	...	...	approx.	80,000
Incorporated	...	...	...	...	58,530
Duplicates distributed	...	...	...	...	16,968
Specimens received on loan	...	...	...	...	2,414
Specimens sent out on loan	...	...	...	...	4,027
Specimens presented or purchased	...	...	...	...	38,536

**FRUIT AND SEED COLLECTIONS.**—These have been added to very considerably during the year. A notable addition was a collection of 691 packets of Canadian Weed Seeds, generously presented by Mr. E. Archibald, Director of the Experimental Farms, Ottawa. A valuable series of fruits was also presented by Mr. B. D. Burt from Tanganyika Territory, including some 50 species of Leguminosae, several of which were not previously represented in the Herbarium. These were received in excellent condition and are accompanied by useful ecological notes.

**COLLECTION OF DRAWINGS AND PHOTOGRAPHS.**—A large number of illustrations of plants have been received during the year and 480 have been placed in the collection. Mr. W. R. Price presented the photographs made during his tour in Formosa, Ceylon and Malaya. Dr. H. M. Hall presented 63 prints of Compositae and *Pentstemon*. A set of useful prints of Cacti was received from the United States National Museum, Washington, and a valuable series of 202 prints of Labiatae, many being of type specimens, was received as a donation from Dr. C. Epling. In addition to the above, whenever time permits the type specimens sent on loan to Kew from other herbaria are photographed and prints placed in the collection. Upwards of a hundred prints were added in this way during the year.

Dr. L. Cockayne and Mr. W. B. R. Oliver sent photographs of New Zealand plants, and Mr. R. A. Dyer of South African Euphorbias. In both these cases the photographs show the habit of the plants and so supply what is often a deficiency in the collection.

Amongst portraits received have been those of Baroness Burdett Coutts, who presented Schimper's Moss herbarium in 1880, and Professors F. O. Bower and J. W. H. Trail.

**NOMENCLATURE.**—Preparations for the International Botanical Congress to be held in 1930, at which the subject of nomenclature will occupy an important place, continued during the year. The general experience of systematic botanists during the eighteen years

which have elapsed since 1910, the date of the Brussels Congress, has been that the International Rules of Nomenclature have on the whole proved satisfactory, and have led to greater uniformity and stability in the naming of plants. As time went on, however, it was increasingly realized that the wording of certain of the Rules is ambiguous, so that even expert nomenclaturists sometimes disagree as to their correct interpretation and their application to particular cases.

One of the more important tasks of the Congress will be to remove such ambiguities in the Rules by means of a revision of the text where necessary. It is chiefly the Rules regarding homonyms and those dealing with non-valid names that are concerned. A memorandum on the subject of generic and specific homonyms was accordingly drawn up at Kew in March, 1928, and sent to a number of representative botanists in different parts of the world, so that the question might receive adequate consideration in advance of the Congress.

Those who have studied the history of plant-nomenclature during the last fifty years are well aware that it is difficult to forecast the general effect of a proposed rule, unless its results have been previously tested in an adequate series of cases. Hence it is not surprising that one or two of the Rules of 1912 should have proved to be unsatisfactory in actual practice. Among them is Art. 56, which deals with the subject of "valid" and "non-valid" names. The great amount of research which is sometimes required in order to ascertain whether a particular name is "valid" or "non-valid" is almost prohibitive. It might possibly be better to discard the concept of "valid" and "non-valid" names and to accept the date of the effective publication of a name for purposes of priority, even although the action of the author in proposing that name contravened the provisions of the International Rules (1912). The effect of this suggested alteration in the Rules is accordingly being tested at Kew, in order to see whether it would on the whole have a beneficial effect in stabilising names in current usage.

The preparation of a supplementary list of conserved generic names has been continued, and is now approaching completion. Numerous names have been suggested for conservation by correspondents abroad and at home, and these cases have been investigated. In some it was found to be unnecessary to conserve the name, since it was actually the correct name for the genus under International Rules (*e.g.*, *Cinnamomum*, discussed in *K.B.* 1928, p. 41). In others it was considered to be inadvisable to conserve a name, owing to its being misapplied (*e.g.*, *Marica* Herb. non Schreb., investigated in *K.B.* 1928, p. 278), or to the arguments in its favour being too weak (*e.g.*, *Villebrunea*, dealt with in *K.B.* 1928, p. 395). A *prima facie* case for conservation was established, however, for about half the names suggested, and some of these have accordingly been added to the supplementary list, which, when completed, will include about

eighty names. It will be submitted to the International Committee on Nomenclature appointed at Ithaca, in 1926, for the purpose of receiving and considering proposals dealing with plant-nomenclature, and of making recommendations on that subject to the International Congress, 1930.

A minor question of nomenclature, yet one of considerable practical importance, is the correct spelling of generic names. The differences of usage in the official publications of Botanic Gardens in various parts of the world were so great, that the authorities of the Brooklyn Botanic Garden were led to issue a series of communications on "International Seed Exchange" (Nos. 1-9: 1923-1928), in the hope of arriving at agreement in this respect. In response to enquiries addressed to Kew from various sources, the correct spelling of numerous generic names has been determined in accordance with the International Rules, and lists, including altogether 181 names, have been published (*K.B.* 1928, pp. 113, 285, 337), or are in the press. It is hoped that these varied examples may serve to illustrate the method of ascertaining the correct spelling of a generic name under the Rules, and may lead to greater uniformity in this respect.

The following papers dealing with nomenclature were prepared at Kew and published during 1928: "*Camphorina* and *Septina*" (*K.B.* 1928, p. 41); "The Correct Spelling of certain Generic Names" (*K.B.* 1928, pp. 113, 285, 337); "*Setaria glauca* and *S. lutescens*" (*K.B.* 1928, p. 147); "The last Issue of the Journal de Botanique" (*K.B.* 1928, p. 155); "The Nomenclature of *Bromus*" (*K.B.* 1928, p. 209); "*Dalzellia* or *Belosynapsis*" (*K.B.* 1928, p. 252); "The Generic Names *Miconia* and *Myconia*" (*K.B.* 1928, p. 268); "*Marica* and *Neomarica*" (*K.B.* 1928, p. 278); "*Oreocnide* versus *Villebrunea*" (*K.B.* 1928, p. 395); "*Juncus alpino-articulatus* (Journ. Bot. 1928, p. 210); "The Standard-Species of *Nymphphaea* L." (*Rhodora*, 1928, p. 53).

INDEX KEWENSIS.—During the past year the compilation of the Index Kewensis, Supplement VII, was completed, and to a large extent prepared for the Press. By the end of the year three-quarters of the manuscript had been despatched to the Clarendon Press, the total number of reference cards being over 34,000. During its preparation citations to several old genera have been added in order to conform to the International Rules; the necessity for these reference changes is in a large measure due to the fact that the year 1735 (and not 1753) was formerly adopted as the starting point for genera. After each generic name the family to which it is now assigned is indicated in brackets; in cases where a genus had been placed in a different family in the 'Genera Plantarum' of Bentham and Hooker that family also is indicated. About half the number of first proof sheets were received and returned by the end of the year. At the present rate of progress the new Supplement should be published during the summer of 1929. The compilation of Supplement VIII (1926-30) has been started.

EXPERIMENTAL WORK.—Although interesting specimens of all kinds are welcome, and are kept under observation in the Experimental Ground, work has tended to concentrate on special genera. In connection with the combined genetical and ecological study on all the British representatives of the genera *Silene* and *Centaurea*, now being carried on at Potterne and Kew, an increasing amount of space is inevitably being devoted to these two genera. Reserves and controls of the experimental material have also to be kept. Selfed lines of *Plantago* have been investigated for the Transplant experiments being undertaken on behalf of the British Ecological Society.

At Potterne, in the grounds of Mr. E. M. Marsden-Jones, a large amount of genetical and biological research is being continued. The work is being extended and the co-operation of a cytologist and an anatomist has been secured. Last year many hundreds of plants of *Silene* and over a thousand of *Centaurea* were flowered and scored, and further controlled crossings were made. The  $F_2$  generation of 450 plants of the new true-breeding tetraploid *Saxifraga pottermensis* was studied and an  $F_3$  generation of 500 plants was raised. Studies on the sex and colour in species of *Ranunculus* and on the microforms of *Anthyllis* were also continued. Four of the six species to be used in the transplant experiments are now in position and interesting results have already been obtained with *Silene maritima*. Mr. R. O. Whyte, of the Botany School, Cambridge University, is studying the cytology of the plants used in the genetical and transplant experiments, and very interesting results have already been obtained with *Ranunculus* and *Silene*. The assistance of Dr. Clara A. Pratt, of the Imperial College of Science, has been secured for anatomical studies and she has commenced work on *Silene*. Extensive series of the specimens used in all these experiments have been dried and presented to Kew.

With the increased attention paid to genetical work and to the intensive biological and experimental study of certain genera it has been necessary to consider the question of the most suitable means of accommodating the material which it is necessary to preserve. To prevent unequal representation in the general Herbarium it was decided to establish two separate herbaria. The small room off the visitors' room, therefore, has been set aside to accommodate an ecological herbarium and a genetical herbarium. These herbaria together are already represented by between two and three thousand sheets and it is expected that they will grow at a rapid rate. An account of the ideas underlying the formation of these herbaria is shortly to appear in the Journal of Ecology.

VISITORS.—About 5,544 names appeared in the visitors' book for 1928.\* The names of some of the most notable and frequent visitors, with an outline of their sphere of work, are given below.

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\*The number of visitors for the year 1927 should have been 5,224 and not that given in *K.B.* 1928, Appendix i. p. 33.

As in previous years Dr. O. Stapf and his staff working on the Botanical Magazine and the Index Londinensis were accommodated in the top floor rooms of the Library. Thanks are due to Dr. Stapf for assistance with various questions relating to the Gramineae. Members of the staffs of various other institutions in or near London also visited the herbarium repeatedly, notably those of the Department of Botany, British Museum (Natural History), the Imperial Bureau of Mycology, the Imperial Forestry Institute, Oxford, and the John Innes Horticultural Institution, Merton. Amongst botanists especially interested in the flora of Britain and various parts of Europe the most frequent callers were Messrs. C. E. Salmon, J. Fraser, E. M. Marsden-Jones, C. C. Lacaita, C. Norman, A. Bruce Jackson, R. Lloyd Praeger and H. W. Pugsley. Mr. L. Hall paid weekly visits in connection with literature on cellulose, and Miss I. Manton, of the Botany School, Cambridge, continued work in the Herbarium and Library in connection with her cytological studies on the root tip of various genera of Cruciferae. Valuable assistance was given by Mr. E. Milne-Redhead in an honorary capacity from September onwards in re-arranging the genus *Campanula* and other material from Europe and the Orient.

Mrs. Clement Reid and Miss M. E. J. Chandler paid their customary visits several times during the year, continuing their investigations on fruits and seeds from the Oligocene and Eocene beds on the Isle of Sheppey. Amongst workers on the lower Cryptogams frequent visits were paid by Mr. H. N. Dixon (Mosses), Mr. R. Paulson (Lichens), and Mr. W. B. Grove, who spent a month at Kew in September studying Fungi.

Several botanists from the Continent stayed at Kew for longer or shorter periods during the year. The late Herr W. Becker, of Kirchmoser (Havel), spent ten days at Kew in the spring working on the Violaceae, and subsequently borrowed a large number of sheets, most of which he returned before his unexpected death in October. Mr. C. Cyrach Larsen, of the Forest Botanical School, Charlottenlund, Denmark, who was at Kew for about six months studying sylviculture, spent a considerable amount of time in the Library, especially with reference to literature on *Larix* and the Douglas Fir. Dr. A. Becherer, of the Botanisches Institut, Basel, stayed at Kew from April to October studying Rhamnaceae and various matters connected with nomenclature and Systematic Botany. Professor Handel-Mazzetti, of Vienna, was at Kew for about ten days during June, working chiefly at critical material collected by him in south-west China. Of visitors from Holland, Dr. W. H. Goddyn, of Leiden, and Dr. J. P. Lotsy paid short visits, in the spring and autumn respectively, with regard to the occurrence of natural hybrids in S. Africa and elsewhere. Miss M. C. Karsten, of Terborg, Gelderland, again worked in the Herbarium for about a month on various groups of succulents, and Miss M. J. A. Faber, of Gorssel, for a shorter period studying literature on garden planning and



design. Dr. H. Wolff, of Berlin, paid a short visit in late summer examining chiefly Indian genera of Umbelliferae. Dr. and Mrs. K. Domin, of Prague, were at work for about six weeks in the Herbarium, being largely engaged in elaborating the ferns collected by them in Dominica in 1926.

Of home workers on Asiatic Botany mention should be made of Mr. H. N. Ridley, to whom Kew is indebted for information on various matters concerning the Malayan flora, and of Mr. I. H. Burkill and Dr. D. Hooper, late Curator of the India Museum, Calcutta, who continued their work on the "Dictionary of Economic Products of the Malay Peninsula." As in previous years, Mr. Burkill kindly named all the specimens of *Dioscorea* received for determination. Mr. W. R. Price paid repeated visits in connection with plants collected by him in Formosa. Professor W. G. Craib spent about six weeks at Kew during the summer vacation working on the flora of Siam, studying particularly the groups of families from Rosaceae to Alangiaceae. Part 3 of vol. i of his "Florae Siamensis Enumeratio" containing the Families Connaraceae and Leguminosae, published at Bangkok, was issued in September, 1928. Dr. Eryl Smith visited the Herbarium frequently to name her collection of ferns from Siam and the neighbouring islands. Dr. J. M. Cowan was at Kew as a volunteer for some months previous to his appointment as a temporary Botanist. Miss Muriel M. Whiting again generously gave her services for a large part of the year, assisting in the re-arrangement of the Malay and Indian material in the Herbarium.

Mr. C. E. Parkinson, Forest Botanist, Burma, spent three months at the Herbarium before his return from leave in April. Dr. F. W. Foxworthy, of the Malay Forest Service, stayed a short time at Kew in March on his way to the United States, and Mr. E. J. Strugnell, of the same service, spent several weeks in the Herbarium during the summer, working on Dipterocarpaceae.

Japan was represented by Dr. T. Tanaka, who during his stay in England paid at intervals many visits to the Herbarium, examining the Kew material of *Citrus*, and Dr. T. Yabe, who spent a short time studying chiefly the genus *Brassica*. Dr. Franklin P. Metcalf, Professor of Botany at the Fukien Christian College, Foochow, China, spent three days at Kew in the late autumn on his way to the Arnold Arboretum, verifying the records of Fukien plants.

As usual, the largest number of visitors from abroad was from the various Colonies and Dependencies in Africa. Sir Ofori Atta, Chief of Akim-Abuakwa, who is deeply interested in the botany of the Gold Coast Colony, paid a visit to the Gardens and Herbarium in June. Professor R. H. Compton, Director of the National Botanic Garden, Kirstenbosch, paid several visits to the Herbarium in January, studying chiefly the Compositae of the Cape Peninsula. Dr. G. B. Wallace, Mycologist to the Department of Agriculture, Tanganyika, spent a considerable time in the Library before his

return from leave in February. Mr. R. E. Massey continued work on the grasses of the Sudan. Major Guy Aylmer, Deputy Conservator of Forests, Sudan, and Messrs. F. R. Irvine (Achimota College, Accra), T. H. Marshall (Tanganyika), F. W. Hall (Uganda), all spent a certain amount of their leave in working out the collections they had sent or brought home. Mr. J. D. Snowden (Uganda) was at Kew for about six months of his leave working almost exclusively on the grasses of Uganda. Mr. B. D. Burt, of the Game Preservation Department, Tanganyika, who brought home nearly 10,000 sheets of Tanganyika material, was three months in the Herbarium assisting in naming the specimens. Several forestry officers, on leave from West Africa after their course of forest botany at the Imperial Forestry School at Oxford, spent a few weeks in the Herbarium working under Dr. J. Burt Davy and Mr. E. E. Kirby. Mr. N. Douglas Simpson, of the Cotton Research Board, Giza, brought home an interesting collection from Lower Egypt and was at Kew about two weeks during August. Mr. P. J. Greenway, of the Imperial Forestry School, was several weeks at the Herbarium before taking up his post as Botanist at the East African Agricultural Research Station at Amani, and Mr. H. Bruins-Lich spent some time studying various aspects of the African flora before his departure to take up his duties as Horticultural Officer, St. Helena. Throughout the year Mr. N. E. Brown was a frequent visitor, working chiefly at South African Mesembryanthemums and various genera of Iridaceae.

Turning to America, British Guiana claimed a large share of attention. Mr. L. S. Hohenkerk (Forest Officer) and Mr. R. A. Altson (lately Government Botanist) paid numerous visits with regard to collections sent home by them. Dr. H. A. Gleason was at Kew for about six months engaged on a study of the flora of the same country. During the course of his visit Dr. Gleason was able to complete the MS. of the Monocotyledons of the proposed Flora with the exception of those families which are being dealt with by other American botanists. As in previous years, Professor A. H. R. Buller (Winnipeg) spent a very large part of his vacation at Kew, being engaged on preparing the MS. of vol. iv. of his important "Researches on Fungi."

Dr. and Mrs. Carl Epling, who came to Kew in 1927, remained in Europe until the middle of August and, with the exception of a three months' visit to the Continent, spent most of their time in the Herbarium continuing their work on the revision of the American Labiatae. Dr. H. M. Hall was in England during September and rendered valuable assistance in naming and arranging the genera *Haplopappus* and *Chrysothamnus* in accordance with his monograph. During his stay in England Dr. W. R. Maxon (U.S. National Museum) paid several visits to the Herbarium, studying material of Jamaica ferns as represented at Kew. He also examined the ferns of the Lehmann collection housed in the Store, and with his invaluable help

a commencement was made with the naming and sorting out of the material of this very extensive collection prior to distribution. Professor S. J. Record (Yale University), Professor W. A. Cannon (Stanford University), Professor B. L. Robinson (Harvard), and Mr. A. W. Rehder (Arnold Arboretum), also visited Kew during the summer.

**ADDITIONS TO HERBARIUM.**—The total number of specimens received during 1928 was about 38,636, of which 2,331 were purchased. The chief sources from which they were obtained were as follows :—

**EUROPE.**—*Presented* : Great Britain, by Messrs. E. M. Marsden-Jones, V. S. Summerhayes, A. R. Horwood, Dr. W. B. Turrill, the Watson Exchange Club (per Mr. W. E. Lousley), Col. H. H. Johnston, Mrs. L. A. M. Riley (herbarium of the late Mr. L. A. M. Riley), Dr. J. Burt Davy (mosses), Messrs. Edgar Thurston, W. R. Price, J. E. Little, Col. R. Raynsford, Mrs. K. M. Reynolds, Dr. A. W. Hill ; Spain, by Mr. C. C. Lacaita, Rev. E. Ellman and Mr. N. Y. Sandwith (coll. Rev. E. Ellman and Mr. N. Y. Sandwith) ; France, by Dr. J. Burt Davy ; Denmark, by Dr. C. Christensen (algae, coll. Prof. Kolderup) ; Hungary, Flora Hungarica, Cent. 8, by the Section of Botany of the National Museum of Hungary, per Dr. Filarszky ; Czechoslovakia, by Brno University (coll. Dr. J. Podpěra) ; Caucasus, by Dr. Woronoff.

*Purchased* : Mr. W. R. Sherrin, European and American Sphagnaceae ; Dr. F. Petrak, Mycotheca Generalis cent. 1.

**ORIENT.**—*Presented* : Macedonia, by Prof. Kosanin ; Palestine, by Department of Agriculture, Palestine ; Persia, by Mr. H. G. Chick and Mr. Hugh Macmillan ; various, by Miss M. E. Edmonds.

*Purchased* : Prof. H. Handel-Mazzetti, "Olympus collection" from Thessalian Greece.

**NORTH ASIA.**—*Presented* : Mongolia, by the University of California, Berkeley, per Dean E. D. Merrill (coll. Mr. Chaney).

**CHINA AND JAPAN.**—*Presented* : by the Royal Botanic Garden, Edinburgh (coll. Messrs. G. Forrest and R. Farrer), Nanking University, per Mr. C. C. Ching (coll. Mr. C. L. Tso), Mrs. E. C. Teichman, Prof. H. Handel-Mazzetti, the Arnold Arboretum (coll. Mr. C. C. Ching), the Government Research Institute, Formosa, per Mr. R. Kanehira (coll. Mr. S. Sasaki and others), and by Fleet-Surgeon C. G. Matthew, R.N.

**INDIA AND CEYLON.**—*Presented* : Assam, by Mrs. A. D. Parry, Capt. F. Kingdon Ward, and Miss E. J. Riddell (coll. Mr. Riddell) ; various, by the Agricultural College, Coimbatore, the Royal Botanic Gardens, Calcutta, Col. H. H. Rich, and Mr. H. H. Haines (the Haines Herbarium) ; Kashmir, by Prof. R. R. Stewart and Mr. B. B. Osmaston ; South Lushai, by Rev.

W. J. L. Wenger ; Nepal (communicated by Col. Sir Clive Wigram), by the Royal Botanic Garden, Edinburgh ; Ceylon, by the Department of Agriculture, Peradeniya (coll. Mr. A. H. G. Alston).

MALAY PENINSULA.—*Presented* : various, by the Director, Botanic Gardens, Singapore, and the Forest Service Department, Kuala Lumpur.

INDO-CHINA.—*Presented* : Siam, by Mrs. D. J. Collins and Dr. A. F. G. Kerr (coll. Dr. A. F. G. Kerr, Noi Put and M. C. Lakshnakara).

MALAY ISLANDS.—*Presented* : Java and North Borneo, by the Director, Botanic Gardens, Buitenzorg ; Philippine Islands, by the University of California, Berkeley, and Mr. E. B. Copeland (Pteridophyta Philippinensia Exsiccata, Cent. i) ; Solomon Islands, by Mr. J. H. L. Waterhouse ; various, by Fleet-Surgeon C. G. Matthew, R.N.

*Purchased* : Mr. C. A. Wenzel, Philippine Islands.

NEW GUINEA.—*Presented* : by Mr. A. Wade.

POLYNESIA.—*Presented* : Fiji, by Mrs. J. D. Tothill.

AUSTRALIA.—*Presented* : New South Wales, by Dr. F. A. Rodway and by the Director, Botanic Gardens, Sydney ; South Australia, by Mr. J. M. Black, Mrs. Holdaway, and Dr. A. W. Hill (lichens from Koonamore Vegetation Reserve) ; North Australia, by Mr. C. E. F. Allen ; Central Australia, by Mr. H. Basedow (coll. Mackay Expedition) ; Western Australia, by Mrs. M. B. Wilkinson (coll. Mrs. Bunbury) ; Victoria, by the Director, National Herbarium, South Yarra ; Queensland, by Mr. C. T. White, Government Botanist.

TASMANIA.—*Presented* : by Mr. A. V. Giblin.

NEW ZEALAND.—*Presented* : by Dr. L. Cockayne (Wellington), Dr. H. H. Allan (Palmerston North), and Mr. H. Carse (Auckland).

TROPICAL AFRICA.—*Presented* : Nigeria, by Mr. Ivan D. Hepburn, and the Botanic Gardens, Victoria, Cameroons (coll. Mr. T. D. Maitland) ; Sierra Leone, by the Lands and Forests Department (coll. Mr. F. C. Deighton) ; Gambia, by the Department of Agriculture (coll. Mr. T. R. Hayes) ; Gold Coast, by Sir A. Kitson, Mr. T. Lloyd Williams, Mr. F. R. Irvine, Mr. W. C. Fishlock, and by the Forestry Department (coll. Mr. C. Vigne) ; Sudan, by the Department of Agriculture (coll. Major G. Aylmer, Major F. E. Kenchington and Mr. M. A. Bailey) ; North East Tropical Africa, by Lady Maffey ; Uganda, by the Department of Agriculture (coll. Messrs. J. D. Snowden and C. G. Hansford) ; Tanganyika Territory, by the Department of Agriculture (coll. Messrs. A. E. Haarer, T. H. Marshall and H. Wolfe), and by the East African Agricultural

Research Station, Amani (coll. Mr. P. J. Greenway) ; Kenya, by Scott Agricultural Laboratories, Department of Agriculture (coll. Messrs. J. McDonald and W. Lyne Watt), and by the Forestry Department (coll. Mr. H. M. Gardner) ; Rhodesia, by the Department of Agriculture (coll. Mr. F. Eyles).

*Purchased* : Mr. F. W. H. Migeod, Nigeria.

MASCARENE ISLANDS.—*Presented* : Mauritius, by Mr. R. E. Vaughan ; Madagascar, by Monsieur H. Perrier de la Bathie.

SOUTH AFRICA.—*Presented* : Cape Province, by Mr. N. S. Pillans, the Hon. Mrs. Ryder, Dr. J. Burt Davy, the Albany Museum, Grahamstown, and the Division of Botany, Pretoria.

NORTH AMERICA.—*Presented* : Greenland (coll. Oxford University Greenland Expedition), per Mr. C. G. Trapnell ; Canada, by Department of Agriculture, Ottawa (seeds), Prof. R. R. Gates and Mr. K. Mellanby (coll. Prof. R. R. Gates and Mr. K. Mellanby) ; United States, by Yale University, University of California, Los Angeles (photographs, per Dr. Epling), Miss Alice Eastwood (coll. Dr. Ivan M. Johnston), and by Dr. H. M. Hall (photographs).

*Purchased* : Mr. W. N. Suksdorf, "Washington's Flora," Fascicle xiii. ; Mr. B. F. Bush, Missouri plants.

CENTRAL AMERICA.—*Presented* : British Honduras, by Mr. H. C. Sampson ; Honduras, by the Rev. Garnet S. Kenyon ; various, by University of Texas, per Mr. E. R. Bogusch.

WEST INDIES.—*Presented* : Trinidad, by the Department of Agriculture (coll. Mr. R. O. Williams), and by Mr. W. E. Broadway.

*Purchased* : Mr. W. E. Broadway, Trinidad plants.

EAST TROPICAL SOUTH AMERICA.—*Presented* : Brazil, by Mr. B. G. C. Bolland.

WEST TROPICAL SOUTH AMERICA.—*Presented* : Ecuador, by Major R. H. Thomas.

*Purchased* : The Berlin Botanic Gardens, Bolivia (coll. Mr. José Steinbach) ; Dr. O. Buchtien, Herbarium Bolivianum, cents. 6 and 7.

TEMPERATE SOUTH AMERICA.—*Presented* : Argentine, by Dr. E. Werdermann (seeds, coll. Dr. Schreiter).

DISTRIBUTION OF DUPLICATES.—The following were the principal institutions to which duplicates were distributed :—

*Great Britain and Ireland*.—Aberdeen, Cruickshank Botanic Gardens ; Cardiff, National Museum of Wales ; Dublin, Trinity College, Botanical School ; Edinburgh, Royal Botanic Garden ; London, British Museum (Natural History) and South London Botanical Museum ; Manchester, The University, Botany Department.

*Europe*.—Belgrade, Botanic Gardens ; Berlin, Botanic Gardens and Museums ; Brno, Masaryk University ; Budapest, National Museum ; Copenhagen, Botanic Institute ; Leiden, 's Rijks Herbarium ; Leningrad, Principal Botanic Garden ; Sarajevo, National Museum ; Sofia, Natural History Museum, the Natural History Museum of the King of Bulgaria, and the University, Department of Botany ; Stockholm, Riksmuseet ; Uppsala, Botanic Museum ; Zürich, Botanic Museum and Garden.

*Asia*.—Nanking, National South-Eastern University.

*Africa*.—Cape Town, Bolus Herbarium ; Pretoria, Division of Botany.

*Australasia*.—Palmerston, Department of Agriculture ; Wellington, Dominion Museum.

*America*.—University of California, Berkeley and Los Angeles ; Chicago, Field Museum ; Harvard University, Gray Herbarium and Arnold Arboretum ; New York, Botanical Garden ; Philadelphia, Academy of Natural Sciences ; San Francisco, Academy of Natural Sciences ; University of Texas ; Washington, D. C., U.S. National Museum.

### The Library.

The following remarks refer to the more important additions received as presentations during the year.

The Bentham Trustees have made several presentations, including :—A. Dietrich, *Flora Regni Borussici*, 1833-44, 12 vols., containing 864 coloured plates ; C. G. Lorek, *Flora Prussica*, ed. 3, 1848 ; H. W. Wollenweber, *Fusaria autographice delineata*, ed. 2, 1926, 659 sheets ; and C. A. M. Lindman, *Bilder ur Nordens Flora*, 1922-26, in 3 vols., containing 663 coloured plates. The last named is a new edition of *Svensk Botanik*, begun early last century and published under the editorship of J. W. Palmstruck and others. The excellent plates in that work have been used again—the figures, slightly altered as to arrangement and analyses, have been classified, and provided with new text by the late Prof. Lindman. Valuable help in securing a copy of the work was afforded by the Misses Elisabet and Ester Björklund of Stockholm. Several periodicals, received in exchange for *Hooker's Icones Plantarum*, have also been presented by the Bentham Trustees.

Sir William Thiselton-Dyer a few months before his death made what proved to be his final contribution to the library. This included J. A. Voelcker's *Report on the Improvement of Indian Agriculture*, 1894 ; *Indian Industrial Commission*, 1916-18, *Report* ; *Leopoldina*, Bd. 1 and 2, and miscellaneous figures of plants, a few of them original. In addition to these he sent the chronometer case which was used by Sir J. D. Hooker on the Antarctic Voyage of the "Erebus" as a gift from Lady Thiselton-Dyer.

Lieut.-Col. Sir David Prain has presented the continuation of several periodicals, amongst which are the *Berichte der Deutschen Botanischen Gesellschaft*, *Bulletin de la Société Botanique de France*,

*Proceedings of the American Philosophical Society, and the Yearbook of Pharmacy . . . and Transactions of the British Pharmaceutical Conference, 1927.*

The Secretary of State for India has presented two copies of the *Flora of the Presidency of Madras*, part 8, containing the families *Ulmaceae* to *Xyridaceae*, by C. E. C. Fischer. It is expected that two more parts will complete the work.

From the Crown Agents for the Colonies have been received six copies of the second part of the *Flora of West Tropical Africa*, by J. Hutchinson and J. M. Dalziel, and publications of the Geological Survey of Nigeria.

The library is indebted to Mrs. Frank Bolus for volume 5 of *Nature Notes*, edited by S. H. Skaife, and *Notes on Mesembrianthemum and some allied genera*, part 1, a volume of 156 pages, with numerous coloured plates and other illustrations, and the first sheet of part 2. These notes have mostly been reprinted from *South African Gardening and Country Life*.

The Carnegie Institution of Washington has presented *The genus Haplopappus: a phylogenetic study in the Compositae* (Publication No. 38), by H. M. Hall, and 12 coloured plates from H. S. Conard's *The Waterlilies* (Publication No. 4). *A Report on American museum work*, by E. E. Lowe, and *A Report on the public museums of the British Isles . . .*, by Sir H. Miers, have been received from the Carnegie United Kingdom Trustees.

Prof. Karel Domin of the Charles University, Prague, has contributed a number of his own publications and has obtained for the library several Czechoslovakian works by other authors. Among the former are: *Vergleichende Studien über den Fichtenspargel*, 1915; *New additions to the Flora of Western Australia*, 1923; and an illustrated *Flora of Czechoslovakia*, by him and Dr. J. Podpěra, published in 1928. This is in Czech and is a second edition of F. Polivka's *Flora of the Crown Land of Bohemia*. Other publications received from Prof. Domin are:—*Die Vegetationsverhältnisse im Gebiete des mährischen Karstes*, by J. Podpěra; *Sylviculture dans la République Tchèqueoslovaque*, 1926 (no. 66 of the Publications of the Ministry of Agriculture of Czechoslovakia); *Acta Botanica Bohemica*, edited by K. Domin and J. Podpěra, vols. iv-vii; *Preslia* (Reports of the Czechoslovak Botanical Society), i, vi, and vii; and *Reliquiae Mrkvíčkanæ*, 1922, by J. Velenovský. A collection of the plates from the first volume of Prof. Domin's *Travels in the West Indies* has been received through Dr. A. W. Hill.

A copy of the *Proceedings and Resolutions*, etc., of the Second British Empire Forestry Conference, Canada, 1923, published at Ottawa in 1927, has been received from the Forestry Commission, and *Abstracts of Papers on Agricultural Research in Great Britain and Northern Ireland*, October, 1926, to September, 1927, has been received from the Secretary to the Imperial Agricultural Research Conference, 1927. The Empire Marketing Board and the Empire

Cotton Growing Corporation have presented selections of the publications issued by them during the year.

The Departement van Landbouw, Nijverheid en Handel in Nederlandsch-Indië has continued to present the publications of its various sections and has supplied a number of the issues of previous years which were required to complete sets. Several *Mededeelingen* have been received from the Kina-Proefstation and from the Proefstation voor Thee, and a number from the Algemeen Proefstation der A.V.R.O.S., Medan, Sumatra.

Books received from the Editor of *Nature* :—L. Burbank and W. Hall, *The Harvest of the years* ; R. M. Laing and E. W. Blackwell, *Plants of New Zealand*, ed. 3 ; G. P. Majumdar, *Vanaspati : plants and plant-life as in Indian treatises and traditions* ; F. Ramaley, *Colorado plant life* ; H. Wolff, *Umbelliferae-Apocynaceae-Ammineae-Carinae*, etc., in Engler's *Das Pflanzenreich* ; all published in 1927 ; also several small works on gardening.

Books received from their publishers for review :—from Messrs. Arnold : Sir Arthur F. Hort, *The unconventional garden* ; from Messrs. Macmillan : C. F. Greeves-Carpenter, *The care of ornamental trees* ; from the Nasionale Pers Beperk, Cape Town : P. A. van der Bijl, *Plantsiektes ; hul oorsaak en bestryding* ; from The Sheldon Press : Ellison Hawks, *Pioneers of plant study* ; from Messrs. Whitcombe and Tombs : H. H. Allan, *New Zealand trees and shrubs and how to identify them*.

The following are independent works or in some cases separates from periodicals or other publications which have been presented by their authors unless otherwise stated :—G. P. Ahern and Helen K. Newton, *Bibliography on woods of the world* (Tropical Plant Research Foundation, Washington ; Scientific Contributions, no. 10) ; D. Atanasoff, *Ergot of grains and grasses*, 1920, published by the U. S. Department of Agriculture, Office of Cereal Investigations (from Mr. A. D. Cotton) ; R. Block, *Catalogue of a private collection of walking sticks* ; British Association, Glasgow Meeting, 1928 : *General Handbook* and *Handbooks for Excursions* (from Dr. W. B. Turrill) ; E. J. Butler, *Report on some diseases of tea and tobacco in Nyasaland*, published by the Department of Agriculture, Nyasaland ; H. F. Comber, *Andes Expeditions*, 1925-6 and 1926-7 : *Field notes of plants collected*, 2 copies (from the Hon. H. D. McLaren) ; M. T. Cook and H. A. Gleason, *Ecological survey of the Flora of Porto Rico in Journ. Dep. Agric. Porto Rico*, xii, nos. 1 and 2 ; B. O. Coventry, *Wild Flowers of Kashmir*, series 2, 1927 ; W. G. Craib, *Florae Siamensis enumeratio*, vol. i, pt. 3 (from the Siam Society, Bangkok) ; G. Delevoy, *Études systématiques des bois du Katanga*, fasc. 1-3 (from the Comité Spécial du Katanga) ; R. E. Dengler, *Theophrastus, De causis plantarum* (a thesis in Greek), 1927 ; E. De Wildeman, *Plantae Bequaertianae*, vol. iv, fasc. 3, and *Contribution à l'étude de la Flore du Katanga*, suppl. 1, 1927 (the latter from the Comité Spécial du Katanga) ; G. Claridge Druce, *British plant list*, ed. 2 ; B.



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*Australia and New Zealand: grass land and other studies* (from Dr. A. W. Hill); V. V. Talanov, *The regions of the best varieties of spring and winter wheats of U.S.S.R.*; C. L. Thays, *El Jardín Botánico . . . de Buenos Aires*; A. Usteri, *Die Pflanzen-Sammlung*, 2. Auflage, 1926 (from Prof. Margaret Barclay Wilson); R. O. Williams and E. E. Cheesman, *Flora of Trinidad and Tobago*, vol. i, pt. 1 and vol. ii, pt. 1, 2 copies (from Director of Agriculture, Trinidad and Tobago, and Secretary of State for the Colonies); L. Wittmack, *Botanik und Kultur der Baumwolle*; E. W. Wulff, *Flora Taurica*, vol. i, fasc. 1, 1927 (from the Nikita Botanic Garden, Yalta, Crimea); Y. Yabe, (1) *An enumeration of plants hitherto known from South Manchuria*, 1912; (2) *Icones Florae Manchuricae*, vol. i, pts. 1 and 2, 1914 and 1920; (3) *A preliminary report on the Flora of the Tsing-Tau region*, 1917; P. M. Zhukovsky, *A critical-systematical survey of the species of the genus Aegilops L.* The year of publication when not stated is 1928.

The periodical and serial publications presented during the year include the following, which have been received from their editors or from the societies or institutions issuing them, unless otherwise stated:—*Acta Horti Botanici Universitatis Latviensis*, vol. ii, nos. 2-3; *Acta Horti Gothoburgensis*, vol. iii; *Acta Phytochimica* (Tokyo), vol. iv, no. 1; *Agricultural Journal of British Guiana*, vol. i, nos. 1-2; *The American Orchid Society Year Book*, 1927; *Annals of the Royal Botanic Gardens, Peradeniya*, vol. vi, pt. 1 (3 copies); *Anuario do Ministerio da Agricultura, Industria e Commercio* (Rio de Janeiro), 1928 (from Mr. E. Teixeira); *Archives de l'Institut Botanique de l'Université de Liège*, vols. v and vi, 1914-27; *Australasian Association for the Advancement of Science, Report of the 18th meeting*, 1926; *Boyce Thompson Institute for Plant Research* (Yonkers, New York), *Contributions*, vol. i, nos. 5-6, and *Professional Papers*, nos. 7-9; *British Fern Gazette*, vol. v, nos. 8-10 (from Mr. C. H. Wright); *Bulletin de l'Institut et du Jardin Botaniques de l'Université de Belgrade*, vol. i, no. 1; *Bulletin du Jardin Botanique de Kieff*, nos. vii-viii; *Bulletin of the Madras Government Museum*, new series, Natural History Section, vol. i, no. 1; *Bulletin of the Rubber Growers' Association*, vol. 10; *Bulletin de la Société Botanique de Bulgarie*, vol. ii; *Bulletin de la Société Botanique de Genève*, vol. xix, fasc. 2, and vol. xx, fasc. 1; *Bulletin de la Société Linnéenne de Lyon*, 7me année (from Dr. A. W. Hill); *Bulletin de la Société Royale de Botanique de Belgique*, vol. lx; *Contributions du Laboratoire de Botanique de l'Université de Montreal*, nos. 9-10; *The Empire Cotton Growing Review*, vol. v; *Erdészeti Kísérletek* (Forest Researches, Sopron, Hungary), vol. xxix, fasc. 3-4, and vol. xxx, fasc. 1-3; *Folia Cryptogamica* (Szeged, Hungary), vol. i, no. 6; *Forestry: the Journal of the Society of Foresters of Great Britain*, vol. ii, no. 1; *Harvard Botanical Gardens, Cienfuegos, Cuba, Report*, 1900-1926; *The Indian Forester*, 1928; *Japanese Journal of Botany*, vol. iii, no. 4, and vol. iv, nos. 1-2; *Journal of the Faculty of Science*,

*Imperial University of Tokyo*, sect. iii, Botany, vol. i, pt. 4 ; *Journal of the Federated Malay States Museums*, vol. xiv, pts. 1-2 ; *Journal of the Gold Coast Agricultural and Commercial Society*, vol. vi, nos. 2-3 ; *Long Ashton, Bristol, Agricultural and Horticultural Research Station, Annual Report*, 1927 ; *Malayan Forest Records*, no. 5 (contains *Malayan plant names*, compiled by J. G. Watson) ; *Malpighia*, anno xxx, containing *Studio monografico sulle specie Americane del gen. Saurauia Willd.* (continuation), by L. Buscalioni and G. Muscatello ; *Mededeelingen van het Phytopathologisch Laboratorium "Willie Commelin Scholten,"* xii ; *Memoir of Tanaka Citrus Experiment Station* (Fukuoka, Japan), vol. i, no. 1 ; *Memoirs of the College of Agriculture, Kyoto Imperial University*, no. 3 ; *Memoirs of the Cotton Research Station, Trinidad*, ser. B (Physiology), no. 1, containing *Studies on the transport of carbohydrates in the Cotton plant*, by T. G. Mason and E. J. Maskell, reprinted from *Ann. Bot.* xlii (from the Empire Cotton Growing Corporation) ; *Natural History Magazine*, vol. i, nos. 5-8 (from the Trustees of the British Museum) ; *New Zealand State Forest Service, Annual Report of the Director of Forestry for the year ended 31st March, 1928* ; *Notes from the Royal Botanic Garden, Edinburgh*, nos. 75-76 ; *Notulae Systematicae* (Herbier du Muséum de Paris, Phanérogamie), tome iv, nos. 4-5 ; *Orchid Review*, 1928 ; *Proceedings of the Imperial Academy* (Japan), vol. iv, nos. 1-9 ; *Quarterly Journal of Forestry*, vol. xxii ; *Report of the Marlborough College Natural History Society*, 1927 ; *Reports of the National Step Reservation "Chapli,"* 1924 and 1928, vols. 3-4 (in Russian) ; *The Rhododendron Society Notes*, vol. iii, nos. 1-3 ; *I Rocznik Polskiego Towarzystwa Dendrologicznego (Annales de la Société Dendrologique de Pologne)*, ii ; *Science Reports of the Tohoku Imperial University* (Sendai, Japan), ser. 2, vol. x, no. 4, and ser. 4, vol. iii, no. 3, fasc. 1-2 ; *Studia Citologica*, edited by the Tanaka Citrus Experiment Station, Fukuoka, Japan, vol. i, nos. 1-2 ; *The Tea Quarterly (Journal of the Tea Research Institute of Ceylon)*, vol. i ; *Te Kura Ngahere (The Sacred Lore of the Forest)*, published by the Forestry Club of the Canterbury (New Zealand) College School of Forestry, vol. ii, no. 3 ; *Tottori Nogaku-Kwaiho (Transactions of the Tottori Society of Agricultural Science, Japan)*, vol. i, no. 1 ; *Trabajos del Museo Comercial de Venezuela*, ii-iv ; *Transactions of the Royal Society of Canada*, sect. v (Biological Sciences), 1927 ; *Transactions of Tomsk State University*, vol. 79, fasc. 1-4 ; *Travaux des Laboratoires de Matière Médicale et de Pharmacie Galénique de la Faculté de Pharmacie de Paris*, tome xviii (from Prof. Ém. Perrot) ; *Tropical Woods* (Yale University School of Forestry), nos. 13-16 ; *The Ukrainian Botanical Review*, vol. iii ; *Union of South Africa, Department of Agriculture, Veterinary Education and Research, Reports* 13 and 14, pts. 1 and 2 and Supplement to pt. 2 ; *University of California Publications in Botany*, vol. xiv, nos. 3-8 ; *University of Colorado Studies*, vol. xvi, nos. 2-3 ; *Watson Botanical Exchange Club, Annual Report*, 1927-28 ; *Welsh Plant Breeding*

*Station, Bulletin*, ser. H, no. 8; *West of Scotland Agricultural College, Department of Plant Husbandry, Research Bulletin*, no. 1; *Year Book of the Public Museum of the City of Milwaukee*, 1927 (from Mr. T. A. Sprague); *The Yellow Dragon* (Queen's College, Hong Kong), vol. xxviii, nos. 11-12, and vol. xxix, nos. 1-11, containing articles on the flora of Hong Kong.

The principal contributors of pamphlets, which are usually separates from periodicals, were :—Mr. C. R. Ball, Dr. F. Börgesen, Prof. V. F. Brotherus, Prof. P. Bugnon, Mr. C. Christensen, Dr. J. Burton Cleland, Dr. G. H. Cunningham, Mr. H. N. Dixon, Mr. G. Einar Du Rietz, Dr. R. E. Fries, Mrs. M. Grieve, Dr. M. Guşuleac, Prof. L. Hauman, Dr. A. W. Hill, Prof. A. S. Hitchcock, Col. H. H. Johnston, Miss M. Karsten, Mr. A. H. S. Lucas, Dr. W. R. Maxon, Prof. C. H. Ostenfeld, Dr. F. W. Pennell, Mr. T. Petch, Mrs. Riley (a set of the botanical papers by the late Mr. L. A. M. Riley), Prof. B. L. Robinson, Prof. K. Rouppert, Prof. B. Shishkin, Prof. C. Skottsberg, Dr. D. F. van Slooten, Dr. W. Small, Dr. J. J. Smith, Mr. T. A. Sprague, Dr. J. Valckenier Suringar, Dr. J. Templeton, M. I. Thériot, Prof. N. I. Vavilov, Dr. Malcolm Wilson, Mr. W. C. Worsdell (35 of his botanical papers bound in one volume), and Prof. P. M. Zhukovsky.

A collection of 82 original paintings of plants on vellum, inserted loosely in a small folio volume, has been presented by Dr. Lewis Evans, of Dawlish, through the kind offices of Mr. George Hubbard, of 45, New Bond Street, W. Most of the plants depicted are British and are named; 7 of the paintings are signed by G. D. Ehret and are dated 1763 to 1767, 3 by S. Taylor, one dated 1778, 1 each by P. Brown, T. Robin and F. P. Nodder, all undated; 69 are unsigned and are mostly undated, but dates ranging from 1767 to 1789 are found. Many of the paintings are of great merit.

The library is indebted to many societies, academies and other institutions, in addition to those already mentioned, for publications, and especially to the Royal Swedish Academy of Sciences, Stockholm; Botanic Garden and Academy of Sciences, Leningrad; Botanical Laboratory of the University of Utrecht; Ministry of Agriculture, Egypt; Sudan Government, Department of Agriculture; Bureaux of Science, Agriculture and Forestry of the Philippine Islands; The Indian Tea Association, Calcutta; Departments of Agriculture of Queensland and Victoria; New York Botanical Garden; Gray Herbarium and Arnold Arboretum of Harvard University; United States Department of Agriculture; Smithsonian Institution; and the California Academy of Sciences.



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*Forestry Department*.—

*Acting Conservator*—A. J. Gibson.

**Victoria.** Melbourne.—

*National Herbarium (South Yarra)*.—

*Government Botanist*—F. J. Rae, B.A., B.Sc., B.Agr.Sc. *Senior*

*Assistant*—J. W. Audas, F.L.S. *Assistant*—P. F. Morris.

*Botanic and Domain Gardens*.—

*Director*—F. J. Rae, B.A., B.Sc., B.Agr.Sc.

*Forests Commission*.—

*Chairman*—A. V. Galbraith.

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*Director*—S. S. Cameron, D.V.Sc., M.R.C.V.S. *Vegetable Pathologist*—D. B. Adam, B.Agr.Sc. *Biologist*—C. French.

*University*.—

*Professor of Botany and Plant Physiology*—A. J. Ewart, D.Sc., Ph.D., F.R.S., F.L.S.

**Western Australia.** Perth.—

*Department of Agriculture*.—

*Director*—G. L. Sutton. *Government Botanist*—C. A. Gardner.

*Plant Pathologist*—H. A. Pittman.

*Department for Forests*.—

*Conservator*—S. L. Kessell, M.Sc., Dip. For. (Oxon).

**Northern Territory.** Port Darwin.—

*Superintendent of Agriculture and Curator, Botanic Gardens*—C. E. F. Allen\*.

**New Guinea.**—

*Department of Agriculture, Rabaul*.—

*Director*—G. H. Murray. *Botanic Gardens, Superintendent*—C. R. Campbell Lloyd. *Demonstration Plantation and Agricultural School Superintendent*—R. A. Hopkins.

**BERMUDA.**

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*Director*—E. A. McCallan. *Plant Pathologist*—H. S. Cunningham, M.S.A., Ph.D. *Horticulturist*—J. C. Nauen\*.

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*Forestry Department*.—

*Conservator*—B. R. Wood, M.A.

**BRITISH HONDURAS.**

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*Conservator*—J. N. Oliphant, M.B.E., B.A.

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National Herbarium, National Museum of Canada.—

*Chief Botanist*—M. O. Malte, Ph.D.

Department of the Interior.—

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Dominion Government Museum, Rocky Mountains Park, Banff, Alta.—

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**Ontario.** Toronto.—

Department of Agriculture.—

*Deputy Minister*—W. B. Roadhouse.

Department of Lands and Forests.—

*Provincial Forester*—E. J. Zavitz.

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*Botany, Professors*.—R. B. Thomson, B.A. (*Phanerogams*), H. S. Jackson, B.A., Ph.D. (*Mycology and Cryptogamic Botany*). *Associate Professors*—D. L. Bailey, Ph.D. (*Pathology*), H. B. Sifton, M.A., Ph.D. (*Ecology*), G. H. Duff, M.A., Ph.D. (*Physiology*).

Guelph.—

Ontario Agricultural College.—

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*Deputy Minister*—A. Grenier.

Department of Lands and Forests.—

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*Professor.—Horticulture*—T. G. Bunting, B.S.A.**Nova Scotia.** Halifax.—

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*Professors of Botany*—A. H. R. Buller, D.Sc., Ph.D., LL.D.,  
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*Professors.—Botany and Biology*—V. W. Jackson, B.A., M.Sc.  
*Horticulture and Forestry*—F. W. Brodrick, B.S.A. *Plant*  
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*logist*—J. W. Eastham, B.Sc. (Vancouver). *Provincial Horti-*  
*culturist*—W. H. Robertson, B.S.A. (Victoria).

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*Professor of Botany*—F. J. Lewis, D.Sc., F.R.S.E., F.L.S.

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**Department of Forests, Port Louis.—**

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**Botanic Gardens.—**

*Curator*—J. Young.

**Dunedin.—****Parks and Reserves.—**

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**Botanic Gardens.—**

*Curator*—D. Tannock\*.

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Forestry Department, Ibadan.—

*Director*—J. R. Ainslie, B.Sc., F.L.S.

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*Superintendent*—T. D. Maitland\*, M.B.E. *Assistant Superintendent*—W. E. Bassett\*.

**NORTH BORNEO.**

Jesselton.—

*Mycologist and Agricultural Adviser*—E. Bateson, A.R.C.S.

Sandakan.—

*Conservator of Forests and Director of Agriculture*—D. D. Wood, B.Sc., M.For.

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Livingstone.—

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Research Station, Mazabuka.—

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Abercorn District.—

*Agriculturist*—U. J. Moffat, B.Sc.

**NYASALAND PROTECTORATE.**

Agricultural Department, Zomba.—

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Forestry Department, Zomba.—

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Department of Agriculture and Forests, American Colony, Jerusalem.—

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**SAINT HELENA.**

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**SOUTH AFRICA.**

Union of South Africa.—

Department of Agriculture.—

Division of Plant Industry, Pretoria.—

*Chief of Division and Director, Botanical Survey*—I. B. Pole Evans, C.M.G., M.A., D.Sc., F.L.S. *Principal Botanist*—E. P. Phillips, M.A., D.Sc., F.L.S. *Botanists*—A. O. D. Mogg, M.A., C. D. B. Liebenberg, B.Sc., C. A. Smith, B.Sc. (*Kew*), R. Marloth, M.A., Ph.D. (*Cape Town*), R. A. Dyer, M.Sc. (*Grahamstown*), Miss M. Henrici, Ph.D. (*Fauresmith*), Miss H. Forbes (*Durban*). *Agrostologist*—Miss S. M. Stent. *Botanical Assistant*—Miss I. C. Verdoorn. *Principal Plant Pathologist*—Miss E. M. Doidge, M.A., D.Sc. *Cryptogamic Herbarium, Mycologist-in-Charge*—Miss A. M. Bottomley, B.A. *Mycologists*—Miss E. S. Moore, D.I.C., Ph.D., A. Leeman, D.Sc., J. E. van der Plank, M.Sc., V. A. Wager, M.Sc. (*Pretoria*), R. Davies, B.Sc. (*Cape Town*), A. P. D. McClean, M.Sc. (*Durban*).

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University of South Africa.—*contd.*

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**Cape of Good Hope Province.—**

Cape Town.—

National Botanic Gardens, Kirstenbosch, Newlands.—

*Director*—R. H. Compton, M.A. *Kirstenbosch Gardens*;

*Curator*—J. W. Mathews\*, *Gardener*—G. A. Davis\*. *Karoo Garden, Whitehill, Curator*—J. Archer.

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South African Museum, Herbarium.—

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Bolus Herbarium.—

*Curator*—Mrs. F. Bolus, B.A. *Assistants*—N. S. Pillans, Miss P.

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Municipal Gardens.—

*Director of Parks and Gardens*—A. W. v. d. Houten\*.

Stellenbosch.—

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*Professors.—Botany*—G. C. Nel, B.A., Ph.D. *Phytopathology and Mycology*—P. A. van der Bijl, M.A., D.Sc.

Grahamstown.—

Albany Museum.—

*Hon. Curator of Herbarium*—R. A. Dyer, M.Sc.

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School of Agriculture.—

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*Botanist*—R. R. Staples.

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*Botanist*—J. Morris, B.Sc.**Transvaal Province.—**

Pretoria.—

Transvaal Museum.—

*Curator of Herbarium*—Miss A. A. Obermeyer.

Johannesburg.—

University of the Witwatersrand.—

*Professor of Botany*—C. E. Moss, M.A., D.Sc., F.L.S.**SOUTHERN RHODESIA.**

Department of Agriculture, Salisbury.—

*Secretary*—C. K. Brain, M.A., D.Sc. *Chief Agriculturist*—H. G. Mundy, F.L.S. *Chief Botanist and Mycologist*—J. C. F. Hopkins, B.Sc. *Tobacco and Cotton Expert*—D. D. Brown. *Horticulturist*—G. W. Marshall. *Agriculturists*—J. A. T. Walters, B.A., C. Mainwaring, D. E. McLoughlin. *Forest Officer*—J. S. Henkel.

**STRAITS SETTLEMENTS.****Straits Settlements.—**

Botanic Gardens Department, Singapore.—

*Director*—R. E. Holttum, M.A., F.L.S. *Assistant Director*—E. J. H. Corner, B.A. *Curator of Herbarium*—M. R. Henderson,B.Sc., F.L.S. *Assistant Curators*—G. A. Best\*, F. Flippance\*

(Penang), J. Lennon.

**Federated Malay States and Straits Settlements.—**

Agricultural Department, Kuala Lumpur.—

*Director*—H. A. Tempany, D.Sc. *Agricultural Instructor (Malay Officers)*—G. E. Mann, M.C., M.A.

Field Division.—

*Chief*—F. W. South, M.A. *Field Officers*—F. Birkinshaw\*,

A. E. C. Doscas, J. Fairweather, F. R. Mason, J. M. Howlett,

M.C., B.A., J. W. Jolly, C. L. Newman, B.Sc., J. A. Craig,

R. C. Heath, B.Sc., W. H. Barnes, F. de la M. Norris, B.Sc.

Division of Economic Botany.—

*Economic Botanist*—H. W. Jack, B.A., D.Sc. *Assistant Economic**Botanists*—W. N. Sands\*, F.L.S., R. B. Jagoe, B.Sc.

**STRAITS SETTLEMENTS.—contd.****Federated Malay States and Straits Settlements.—contd.—**

Agricultural Department, Kuala Lumpur.—*contd.*—

Mycological Division.—

*Mycologist*—A. Sharples, A.R.C.S., D.I.C. *Assistant Mycologists*—

A. Thompson, B.Sc., R. A. Altson, A.R.C.S., B.Sc., F. S. Ward, B.S.A.

Agricultural Division.—

*Agriculturist*—B. Bunting, F.L.S. *Assistant Agriculturists*—

J. N. Milsum\*, F.L.S., T. D. Marsh, E. A. Curtler, M.A., J. Lambourne\*, J. L. Greig, B.Sc., B.Sc.(Agr.). *Horticultural Assistants*—H. Ritchings\*, F. S. Banfield\*, F.L.S.

Division of Economics.—

*Agricultural Economist*—D. H. Grist.

Division of Plant Physiology.—

*Plant Physiologist*—W. N. C. Belgrave, B.A.

Forestry Department.—

*Director of Forestry*—J. Mead. *Forest Research Officer*—F. W. Foxworthy, Ph.D.

Rubber Research Institute of Malaya.—

*Director*—\_\_\_\_\_.

Botanical Division.—

*Head*—\_\_\_\_\_. *Geneticist*—L. E. Morris, M.A.

*Plant Physiologist*—C. E. T. Mann, M.Sc. *Field Officer*—F. Billington, M.A. *Assistant Botanist*—K. N. Kaimal, B.A.

Pathological Division.—

*Head*—J. R. Weir, A.B., Ph.D. *Plant Pathologists*—A. R. Sanderson, F.L.S., H. Sutcliffe, A.R.C.S. *Field Officer*—F. Beeley, B.Sc.

**SUDAN.**

Department of Agriculture and Forests, Khartoum.—

*Director*—W. A. Davie. *Assistant Director*—J. N. Cameron. *Chief*

*Conservator of Forests*—J. Smith. *Deputy Conservator of Forests*—

G. Aylmer. *Plant Breeder*—M. A. Bailey. *Government Botanist*—

R. E. Massey, F.L.S.

Palace Gardens.—

*Superintendent*—F. S. Sillitoe\*, M.B.E., *Assistant Superintendents*—

J. Robbie\*, F. W. Thorns\*.

**TANGANYIKA TERRITORY.**

East African Agricultural Research Station, Amani.—

*Director*—W. Nowell, C.B.E., D.I.C., F.L.S. *Geneticist*—L. R.

Doughty. *Plant Pathologist*—H. H. Storey, M.A., Ph.D.

*Physiologist*—F. J. Nutman, A.R.C.S., M.Sc. *Botanist*—P. J.

Greenway\*. *Superintendent of Plantations*—F. M. Rogers\*.

*Assistant Superintendent of Plantations*—K. E. Toms\*.

**TANGANYIKA TERRITORY.—contd.**

**Agricultural Department, Dar-es-Salaam.—**

*Director*———. *Deputy Director*—H. Wolfe, M.Sc.  
*Senior Agricultural Officers*—D. Prain, J. F. C. O'Brien. *Mycologist*  
 —G. B. Wallace, B.Sc.(Agr.), Ph.D. *District Agricultural*  
*Officers*—A. E. Haarer, L. C. Edwards, C. K. Latham, B.Sc.,  
 A. S. Richardson, B.Sc., A. J. Wakefield, B.Sc., D. G. Burns, B.A.,  
 G. M. H. Sutherland, B.Sc., W. J. Hill, C. B. Garnett, B.A.,  
 D. Sturdy, B.A., H. Musk\*, A. S. Stenhouse, B.Sc., C. Harvey,  
 B.Sc., C. J. McGregor, N. V. Rounce, A. H. Savile, J. E. Bruce,  
 R. M. Maynard, F. R. Sanders, B.A., R. D. Linton, B.Sc.,  
 J. Robertson, B.Sc., B. J. Hartley, W. B. Hutchinson. *Cotton*  
*Investigators*—H. Marsland, B.Sc., T. C. Cairns, B.Sc. *Head*  
*Gardener, Dar-es-Salaam*—T. H. Marshall\*.

**Forestry Department, Lushoto.—**

*Conservator*—D. K. S. Grant.

**Department of Tsetse Research, Kondoa Irangi.—**

*Director*—C. F. M. Swynnerton. *Deputy Director and Ecologist*—  
 J. F. V. Phillips, D.Sc. *Botanists*—G. W. St. C. Thompson,  
 B.A., B. D. Burt.

**UGANDA PROTECTORATE.**

**Agricultural Department, Kampala.—**

*Director*—J. D. Tothill, B.Sc., D.Sc. *Deputy Director*—L. Hewett.  
*Mycologist*—C. G. Hansford, M.A. *Botanist*—L. C. C. Liebenburg,  
 M.Sc. *Cotton Botanist*—G. W. Nye, B.Sc. *Assistant Cotton*  
*Botanist*—H. R. Hosking, B.Sc., A.R.C.S. *Senior Agricultural*  
*Officers*—A. R. Morgan, G. F. Clay, M.C., B.Sc. *Superintendent*  
*of Agricultural Education*—E. G. Staples, M.A. *Agricultural*  
*Officers*—J. D. Snowden\*, R. T. Wickham, C. E. J. Biggs, B.Sc.,  
 D. S. Davies, B.Sc., A. B. Killick, B.Sc., N. S. Haig, B.Sc., E. F.  
 Martin, R. W. Stuckey, B.A., B.S.A., C. W. L. Fishlock, B.Sc.  
*Plantation Managers*—G. T. Philpott\*, P. Chandler\*, J. S.  
 Harmsworth, M.C., C. Hazel\*, E. A. Ruck\*. *Coffee Officer*—  
 W. L. Munn.

**Forestry Department, Entebbe.—**

*Adviser of Forestry, Kenya and Uganda*—J. W. Nicholson, B.A.  
*Conservator*———.

**WEST INDIES.**

**Imperial College of Tropical Agriculture, Trinidad.—**

*Principal*—G. Evans, C.I.E., M.A. *Commissioner of Agriculture*  
*for the West Indies*—H. A. Ballou, M.Sc. *Assistant Commissioner*  
 —G. A. Jones. *Professors.—Botany and Genetics*—E. E.  
 Cheesman, M.Sc., A.R.C.S. *Mycology and Bacteriology*—H. R.  
 Briton-Jones, Ph.D., D.Sc., D.I.C., A.R.C.S. *Agriculture*—R.  
 Cecil Wood, M.A. *Lecturers.—Botany*—R. E. Hunter, B.Sc.  
*Mycology*—A. K. Briant, M.A. *Agriculture*—D. H. Brown.  
*Banana Research Officers.—Pathologist*—C. W. Wardlaw, D.Sc.,  
 Ph.D., F.R.S.E. *Physiologist*—L. P. McGuire, M.Sc., Ph.D., D.I.C.

**WEST INDIES.—contd.****Barbados.—**

Department of Science and Agriculture.—

*Director*—R. W. R. Miller, B.A. *Assistant Director*—C. C. Skeete, B.A. *Geneticist*—A. E. S. McIntosh, B.Sc.

**Jamaica.—**

Department of Science and Agriculture.—

*Director*—H. H. Cousins, M.A. *Microbiologist*—F. E. V. Smith, B.Sc. *Travelling Instructors*—A. Wates, J. Briscoe. *Superintendent of Agriculture*—M. S. Goodman (acting). *Public Gardens and Plantations* :—*Superintendent*—M. S. Goodman. *Horticulturist*—E. Downes\*. *Farm Superintendent*—R. S. Martinez.

Agricultural Society.—

*Secretary and Treasurer*—L. L. Carrington.

**Leeward Islands.—**

**Federal** (Antigua). Department of Agriculture.—

*Government Chemist and Superintendent of Agriculture*—A. E. Collens.

**Antigua.** Agricultural Department.—

*Agricultural Superintendent*—A. Gallwey. *Agricultural Assistant*—H. St. J. S. Bell.

**St. Kitts—Nevis.** Agricultural Department.—

*Agricultural Superintendent*—R. E. Kelsick. *Agricultural Instructor (Nevis)*—W. I. Howell.

**Dominica.** Botanical Department.—

*Curator, Botanical Gardens and Agricultural Superintendent*—F. G. Harcourt\*. *Assistant Curators*—F. L. Squibbs\*, H. P. Pidduck.

**Montserrat.** Agricultural Department.—

*Curator*—C. A. Gomez.

**Virgin Islands.** Agricultural Department, Botanic Station.—

*Curator and Agricultural Superintendent*—J. L. Illingworth, B.A.

**Trinidad and Tobago.** Department of Agriculture.—

*Director*—E. J. Wortley, O.B.E., F.L.S. *Assistant Director*—S. M. Gilbert, B.Sc.(Agr.). *Mycologist*—F. Stell, B.Sc., A.R.C.S. *Assistant Botanist*—R. O. Williams\*.

Forest Department.—

*Conservator*—R. C. Marshall, M.A.

**Windward Islands.**

**Grenada.** Agricultural Department.—

*Agricultural Officer*—W. O'B. Donovan.

**St. Lucia.**—Agricultural Department.—

*Superintendent*—E. A. Walters\*. *Assistant Agricultural Superintendent*—R. W. Niles.

**St. Vincent.** Agricultural Department.—

*Superintendent*—T. Jackson\*.

**WESTERN PACIFIC.****Tonga Islands.—**

Department of Agriculture.—

*Director*—H. P. Ritchie.

**ZANZIBAR.****Agricultural Department—**

*Director and Government Chemist*—V. H. Kirkham, B.Sc. *Assistant Director*—H. Waterland. *Manager of Plantations*—G. Tomson. *Agricultural Officers*—J. E. Baker, J. R. P. Soper, B.A., T. D. Rutter, B.Sc.

**INDIA AND BURMA.****Government of India.†****Botanical Survey, Calcutta.—**

*Director*—C. C. Calder, B.Sc., B.Sc.(Agric.), F.L.S. *Curator, Industrial Section*—S. N. Bal, M.Sc., Ph.C., F.L.S. *Systematic Assistant*—T. D. Srinivasan, M.A.

**Forest Department.—**

*Inspector-General and President, Forest Research Institute and College, Dehra Dun*—A. Rodger, O.B.E., F.L.S. *Botanist*—R. N. Parker.

**Department of Agriculture.—****Imperial Institute of Agricultural Research, Pusa.—**

*Agricultural Adviser to Government of India and Director*—W. McRae, M.A., D.Sc., F.L.S. (offg.). *Economic Botanist*—F. J. F. Shaw, D.Sc., A.R.C.S., F.L.S. *Mycologist*—J. F. Dastur, M.Sc., D.I.C. (offg.).

**Bengal.—****Forest Department, Darjeeling.—**

*Conservator*—E. O. Shebbeare.

**Department of Agriculture, Dacca.—**

*Director*—R. S. Finlow, C.I.E., B.Sc. *Economic Botanist*—G. P. Hector, M.A., D.Sc.

**Royal Botanic Gardens, Calcutta.—**

*Superintendent*—C. C. Calder, B.Sc., B.Sc.(Agric.), F.L.S. *Curator of Herbarium*—K. P. Biswas, M.A. *Curator of Garden*—N. Mitra. *Assistant Curator*—M. Jones. *Assistant Curator, Calcutta Gardens*—S. N. Basu.

**Agri-Horticultural Society of India, Calcutta.—**

*Secretary*—S. Percy-Lancaster, F.L.S.

**Lloyd Botanic Garden, Darjeeling.—**

*Superintendent*—C. C. Calder, B.Sc., B.Sc.(Agric.), F.L.S. *Curator*—J. E. Leslie\*.

**Cinchona.—**

*Superintendent of Cinchona Cultivation*—C. C. Calder, B.Sc., B.Sc.(Agric.), F.L.S. *Managers*—(*Mungpoo*) P. V. Osborne\*, (*Munsong*) H. Thomas\*. *Assistant Managers*—(*Mungpoo*) G. H. Fothergill, (*Munsong*) L. G. Richards\*, P. W. Cresswell.

**Government House Gardens, Darjeeling.—**

*Curator*—J. T. Johnson\*.

† Officers of the various Departments will be found under the Provinces and Administrations to which they are attached.

**INDIA AND BURMA.—contd.****Madras.—**

Forest Department, Madras.—

*Chief Conservator*—R. D. Richmond.

Department of Agriculture, Madras.—

*Director*—G. R. Hilson, B.Sc. *Economic Botanists*—R. O. Iliffe, M.A., F.L.S. (*Paddy*), V. Ramanatha Ayyar (*Cotton*), G. N. Rangaswami Ayyangar, B.A. (*Millet*s). *Government Mycologist*—S. Sundararaman, M.A. *Systematic Botanist*—V. Narayanaswami, M.A.

Government Botanic Gardens and Parks, Ootacamund.—

*Curator*—F. H. Butcher\*.

Agri-Horticultural Society, Madras City.—

*Superintendent*—G. W. Thompson.

Cinchona Department.—

*Deputy Director of Agriculture, Cinchona, Ootacamund*—A. Wilson, M.A., B.Sc. *Superintendents*—(*Dodabetta*)———, (*Nedivattam and Hooker*) W. H. P. Collins, (*Valparai Anamallais*) D. M. Gall.

**Bombay.—**

Forest Department, Poona.—

*Chief Conservator*—H. L. Newman.

Agricultural Department, Poona.—

*Director*—T. F. Main, O.B.E., B.Sc. *Economic Botanist*—W. Burns, D.Sc.

Municipal Gardens, Bombay City.—

*Superintendent*—D. S. Laud.

Empress Botanical Garden, Poona.—

*Superintendent*—N. M. Bhagawat.

Government Gardens, Poona.—

*Superintendent*—E. Little\*.

**United Provinces of Agra and Oudh.—**

Forest Department, Naini Tal.—

*Chief Conservator*—F. R. Channer, O.B.E.

Department of Agriculture, Lucknow.—

*Director*—G. Clarke, C.I.E. *Economic Botanists*—R. L. Sethi, M.Sc., B. Ram Parshad, T. S. Sabnis, M.Sc. *Plant Pathologist*—P. K. Dey, M.Sc. *Deputy Director of Gardens, Saharanpur*—W. Head\* (offg.). *Superintendents of Gardens*: Agra—V. E. Morgan (offg.), Allahabad—W. S. Smith, M.C. (offg.), Saharanpur—F. H. Johnson (offg.), Kumaon—L. F. Ruse\*, Lucknow—R. D. Fordham.

**Punjab.—**

Forest Department, Lahore.—

*Chief Conservator*—A. D. Blascheck.

Department of Agriculture, Lahore.—

*Director*—D. Milne, C.I.E., B.Sc. *Associate Professor of Botany, Agricultural College, Lyallpur*—Rai Sahib L. Jai Chand Luthra.

Delhi.—

*Superintendent, Historic and other Gardens*—R. H. Locke\*.

*Superintendent, Arboricultural Operations, New Delhi*—W. R. Mustoe\*.

Lahore, Government Gardens.—

*Superintendent*—A. Hardie\*.

Simla, Mashobra, and Delhi, Viceregal Estate Gardens.—

*Superintendent*—E. Long\*.

**INDIA AND BURMA.—contd.****Bihar and Orissa.—**

Forest Department, Ranchi.—

*Conservator*—A. J. Gibson, F.L.S.

Agricultural Department, Sabour.—

*Director*—D. R. Sethi, M.A., B.Sc.

**Burma.—**

Forest Department, Rangoon.—

*Chief Conservator*—H. W. A. Watson. *Forest Botanist*—C. E. Parkinson.

Agricultural Department, Rangoon.—

*Director*—A. McKerral, M.A., B.Sc. *Economic Botanist*—D. Rhind, B.Sc. *Mycologist*—U. Thet Su, B.Agr., D.I.C.

Government Botanic Garden, Maymyo.—

*Superintendent*—C. Bogg.

Agri-Horticultural Society.—

*Superintendent*—C. A. Giffening.

Cinchona.—

*Superintendent, Cinchona Cultivation, Burma*—P. T. Russell\*.

**Central Provinces.—**

Forest Department, Pachmarhi.—

*Chief Conservator*—C. A. Malcolm.

Department of Agriculture, Nagpur.—

*Director*—F. J. Plymen, C.I.E. *Economic Botanist for Cotton*—W. Youngman, B.Sc., Ph.D. *Mycologist*—Jeewansingh, M.Sc.

*Second Economic Botanist*—D. N. Mahta, B.A., F.L.S.

Nagpur Public Gardens.—

*Officer-in-Charge*—D. N. Mahta, B.A., F.L.S.

**Assam.—**

Forest Department, Shillong.—

*Chief Conservator*—F. H. Cavendish.

*Director of Agriculture and Industries and Registrar of Co-operative Societies*—Rai Bahadur Kanak Lal Barua.

Shillong, Government Gardens.—

*Superintendent*—R. Badgery\*.

**North West Frontier Province.—**

*Deputy Conservator of Forests*—G. R. Henniker-Gotley, D.S.O., B.A.

*Agricultural Officer*—W. Robertson Brown\*.

**Port Blair and Nicobars, Port Blair.—**

*Chief Forest Officer*—L. Mason, O.B.E., M.C.

**Indian States.—**

**Mysore.** Bangalore.—

*Director of Agriculture*—Leslie C. Coleman, M.A., Ph.D. *Superintendent of Government Gardens*—H. C. Javaraya, F.L.S.

Forest Department, Bangalore.—

*Chief Conservator*—B. V. Ramaiengar.

**Baroda.**

State Gardens.—

*Superintendent*—T. R. Kothavala.



**INDIA AND BURMA.—contd.****Kashmir and Jammu.—**

Forest Department.—

*Chief Conservator*—H. L. Wright, B.A.**Gwalior.—**

State Gardens.—

*Director*—C. M. Tembe, F.L.S.**Central India and Rajputana.—**

Indore, Institute of Plant Industry.—

*Director*—A. Howard, C.I.E., M.A.

Udaipur.—

*Superintendent of Gardens*—M. L. Bohra.**Madras.—**

Travancore, Trivandrum.—

*Director of Agriculture and Fisheries*—N. Kunjan Pillai, M.A.,  
B.Sc., Ph.D. *Superintendent, Museum and Public Gardens*—  
G. N. Tampi, B.A.

# BULLETIN OF MISCELLANEOUS INFORMATION Appendix III 1929 ROYAL BOTANIC GARDENS, KEW

## LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs, which, for the most part, have ripened at Kew during the year 1929. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

## HERBACEOUS PLANTS.

*Acaena adscendens*  
    *argentea*  
    *glabra*  
    *laevigata*  
    *macrostemon*  
    *myriophylla*  
    *myriophylla* x  
        *Sanguisorbae*  
    *novae-zelandiae*

*Acantholimon acerosum*  
    *glumaceum*  
    *venustum*

*Acanthus longifolius*  
    *Perringii*

*Achillea ageratifolia*  
    —var. *tomentosa*  
    *alpina*  
    *argentea*  
    *chrysocoma*  
    *Clavennae*  
    *conjuncta*  
    *crithmifolia*

*Achillea*—*cont.*  
    *filipendulina*  
    *Gerberi*  
    *grandiflora*  
    *Grisebachii*  
    *impatiens*  
    *impunctata*  
    *Jaborneggii*  
    *Kellereri*  
    *ligustica*  
    *lingulata*  
    —var. *buglosis*  
    *macedonica*  
    *Millefolium*  
    *moschata*  
    *nana*  
    *odorata*  
    *Ptarmica*  
    *pyrenaica*  
    *rupestris*  
    *serbica*  
    *taygetea*  
    *tomentosa*  
    *umbellata*  
    *Wilczekii*

*Aconitum Fischeri*  
    *Forrestii*  
    *luridum*  
    *Lycotconum*  
    *Napellus*  
    —var. *carneum*  
    —var. *giganteum*  
    —var. *tauricum*  
    *orientale*  
    *paniculatum*  
    *uncinatum*  
    *variegatum*  
    *volubile*  
    *vulparia*

*Actaea alba*  
    *spicata*  
    —var. *arguta*  
    —var. *rubra*

*Actinomeris squarrosa*

*Adenophora diplodonta*  
    *latifolia*

*Adenostyles glabra*

*Adonis amurensis*  
    *annuus*  
    *vernalis*  
    *wolgensis*

*Aethionema amoenum*  
    *armenum*  
    *cappadocicum*  
    *diastrophis*  
    *grandiflorum*  
    *pulchellum*  
    *schistosum*

*Agrimonia Eupatoria*  
    *leucantha*  
    *odorata*

*Agropyron acutum*  
    *caninum*  
    *cristatum*  
    *intermedium*

*Agropyron—cont.*  
    *prostratum*  
    *pungens*  
    *repens*  
    *tenerum*  
    *villosum*

*Agrostis alba*  
    —var. *stolonifera*  
    *canina*  
    *nebulosa*

*Aira caryophyllea*

*Ajuga genevensis*  
    *reptans* var. *alba*  
    —var. *atropurpurea*

*Alchemilla acutiloba*  
    *alpina*  
    *Hoppeana*  
    *pentaphyllea*  
    *vulgaris*

*Allium ampeloprasum*  
    *angulosum*  
    *Beesianum*  
    *Bidwilliae*  
    *carinatum*  
    *coeruleum*  
    *cyaneum*  
    *Farreri*  
    *giganteum*  
    *grande*  
    *Heldreichii*  
    *hymenorrhizum*  
    *kansuense*  
    *karataviense*  
    *macranthum*  
    *Moly*  
    *narcissiflorum*  
    *neapolitanum*  
    *nigrum*  
    *odorum*  
    *Ostrowskianum*  
    *oviflorum*  
    *paradoxum*  
    *Rosenbachianum*

*Allium*—*cont.*

roseum  
Schoenoprasum  
scorzonerifolium  
sphaerocephalum  
stellatum  
subangulatum  
subhirsutum  
tanguticum  
Tubergenii  
ursinum  
yunnanense  
zebdanense

*Alonsoa Warscewiczii*

*Alopecurus arundinaceus*  
myosuroides  
pratensis

*Alstroemeria aurantiaca*  
haemantha  
—var. rosea

*Althaea armeniaca*  
cannabina  
ficifolia  
pallida  
rosea  
Sibthorpii  
taurinensis

*Alyssum argenteum*  
creticum  
maritimum  
Moellendorffianum  
orientale  
rostratum  
saxatile  
sinuatum  
spinosum  
Wulfenianum

*Amarantus caudatus*  
hypochondriacus  
polygamus  
retroflexus

*Ambrosia trifida*

*Ammophila arenaria*

*Amphoricarpus elegans*

*Anagallis arvensis*  
—var. coerulea  
grandiflora  
—var. coccinea

*Anaphalis margaritacea*  
triplinervis

*Anchusa italica*  
officinalis

*Androsace albana*  
carnea  
— var. brigantiaca  
occidentalis  
primuloides  
sarmentosa  
sarmentosa x villosa  
villosa

*Andryala Agardhii*

*Anemone albana*  
altaica  
blanda  
— var. atrocaerulea  
cylindrica  
demissa  
Hepatica  
magellanica  
montana var. rubra  
multifida  
nemorosa  
— var. Robinsoniana  
patens  
polyanthes  
pratensis  
— var. montana  
Pulsatilla  
— var. alba  
— var. amoena  
Regeliana  
rivularis  
sylvestris  
— var. grandiflora  
vitifolia

*Angelica ampla*  
*Anoda hastata*  
     *Wrightii*  
*Antennaria alpina*  
     *dioica*  
     — var. *tomentosa*  
*Anthemis arvensis*  
     *carpathica*  
     *Cota*  
     *Cupaniana*  
     *mixta*  
     *tinctoria*  
     — var. *alba*  
     *Triumfettii*  
*Anthericum Halleri*  
     *Liliago*  
     — var. *algeriense*  
     *ramosum* var. *Dorsetii*  
*Anthyllis montana*  
     *tetraphylla*  
*Antirrhinum Asarina*  
     *majus*  
     *Orontium*  
*Apera Spica-venti*  
*Aphyllanthes monspeliensis*  
*Aplopappus coronopifolius*  
     *croceus*  
     *pectinatus*  
*Aquilegia Buergeriana*  
     *chrysantha*  
     *formosa*  
     — var. *truncata*  
     *glandulosa*  
     *lactiflora*  
     *Moorcroftiana*  
     *nevadensis*  
     *Skinneri*  
     *Stuartii*  
     *vulgaris*

*Aquilegia—cont.*  
     — var. *olympica*  
     — var. *stellata*

*Arabis albida*  
     — var. *rosea*  
     — var. *variegata*  
*Allionii*  
     *arenosa*  
     *aubrietoides*  
     *bellidifolia*  
     — var. *variegata*  
     *hirsuta*  
     *incana*  
     *muralis*  
     — var. *rosea*  
     *Scopoliana*  
     *Sturii*

*Aralia californica*  
     *racemosa*

*Archangelica officinalis*

*Arctium Lappa*

*Arctotis stoechadifolia*

*Arenaria aretioides*  
     *austriaca*  
     *balearica*  
     *Bertolonii*  
     *foliosa*  
     *gothica*  
     *grandiflora*  
     *gypsophiloides*  
     *Koriniana*  
     *laricifolia*  
     *Ledebouriana*  
     *maritima*  
     *montana*  
     *pinifolia*  
     *purpurascens*  
     *sajanensis*  
     *saxatilis*  
     *serpyllifolia*  
     *Steveniana*  
     *verna*  
     *Villarsii*

*Argemone mexicana*  
— var. *ochroleuca*  
*platyceras*  
— var. *hispida*

*Arisaema amurense*

*Armeria alpina*  
*caespitosa*  
*canescens*  
*elongata*  
*juncea*  
*leucocephala*  
*maritima*  
— var. *alba*  
— var. *lauchiana*  
*plantaginea*  
*Welwitschii*

*Arnica amplexicaulis*  
*Chamissonis*  
*foliosa*  
*longifolia*  
*montana*  
*sachalinensis*

*Arrhenatherum elatius* var.  
*bulbosum*

*Artemisia coerulescens*  
*integrifolia*  
*lanata*  
*Ludoviciana*  
*parviflora*  
*Purshiana*  
*rupestris*  
*vulgaris*

*Asarum caudatum*  
*grandiflorum*

*Asclepias syriaca*

*Asperella Hystrix*

*Asperula azurea*  
*cynanchica*  
*galioides*  
*tinctoria*

*Asphodeline liburnica*  
*lutea*

*Asphodelus albus*

*Aster alpinus*  
*Amellus*  
*brachytrichus*  
*carolinianus*  
*Curtisii*  
*Douglasii*  
*Farrerii*  
*foliaceus*  
*furcatus*  
*gayanus*  
*glaucus*  
*Glehnii*  
*Herveyi*  
*heterochaetus*  
*himalaicus*  
*laevis*  
*lateriflorus*  
*likiangensis*  
*linariifolius*  
*Lipskyi*  
*macrophyllus*  
*multiflorus*  
*multiradiatus*  
*oreophilus*  
*puniceus*  
*Purdomii*  
*pyrenaicus*  
*Radula*  
*sagittifolius*  
*sibiricus*  
*spectabilis*  
*staticifolius*  
*stellaris*  
*subcoeruleus*  
*Thomsonii*  
*tibeticus*  
*tricephalus*  
*Tripolium*  
*umbellatus*  
*VahlII*  
*vestitus*  
*yunnanensis*

<i>Astilbe chinensis</i> Thunbergii	<i>Beckmannia eruciformis</i>
<i>Astragalus alopecuroides</i> ambigua aristatus boeticus chinensis chlorostachys Cicer danicus var. albus Echinus frigidus Glycyphyllos hamosus pentaglottis sulcatus Wulfenii	<i>Bellium bellidioides</i> minutum
<i>Astrantia Biebersteinii</i> helleborifolia major	<i>Bellis mexicana</i>
<i>Athamanta Haynaldii</i> Matthioli	<i>Berkheya Adlamii</i>
<i>Atriplex hortense</i> littorale sibiricum	<i>Beta maritima</i> trigyna vulgaris
<i>Atropa Belladonna</i>	<i>Bidens ferulaefolia</i> pilosa tripartita
<i>Avena brevis</i> fatua nuda pratensis pubescens sativa	<i>Biscutella auriculata</i> didyma laevigata
<i>Baeria coronaria</i>	<i>Biserrula Pelecinus</i>
<i>Ballota acetabulosa</i>	<i>Blumenbachia insignis</i>
<i>Baptisia australis</i> leucantha perfoliata	<i>Boehmeria japonica</i>
<i>Barbarea arcuata</i> vulgaris	<i>Boltonia asteroides</i> — var. decurrens
	<i>Borrago officinalis</i>
	<i>Bouteloua racemosa</i>
	<i>Brachycome iberidifolia</i>
	<i>Brachypodium distachyum</i> pinnatum silvaticum
	<i>Brassica alba</i> balearica campestris Erucastrum nigra
	<i>Briza maxima</i> minor

*Bromus carinatus*  
    *inermis*  
    *macrostachys*  
    *madritensis*  
    *racemosus*  
    *rubens*  
    *tectorum*  
    *unioloides*

*Brunnea macrophylla*

*Bryonia alba*

*Bulbine annua*

*Bulbinella Hookeri*

*Bulbocodium vernum*

*Bunias orientalis*

*Bupthalmum salicifolium*

*Bupleurum stellatum*

*Butomus umbellatus*

*Caccinia glauca*

*Cakile maritima*

*Calamagrostis Epigeios*  
    *lanceolata*  
    *pseudo-phragmites*

*Calamintha Clinopodium*  
    *grandiflora*  
    *Nepeta*  
    *officinalis*

*Calandrinia grandiflora*  
    *Menziesii*  
    *pilosiuscula*

*Calceolaria acutifolia*  
    *biflora*  
    *mexicana*  
    *Valdiviana*

*Calendula arvensis*  
    *officinalis*

*Callirrhoe digitata*  
    *involuta*  
    *pedata*

*Callistephus chinensis*

*Caltha biflora*  
    *palustris*  
    *polypetala*  
    *radicans*

*Calystegia hederacea*  
    *sepium*  
    *silvestris*

*Camassia Cusickii*  
    *esculenta*  
    *Leichtlinii*  
    *montana*

*Camelina Alyssum*  
    *sativa*

*Campanula alliariaefolia*  
    *alpestris*  
    *barbata*  
    *bononiensis*  
    *caespitosa*  
    *carpatica*  
    — var. *alba*  
    — var. *turbinata*  
    *cochlearifolia*  
    — var. *alba*  
    — var. *pallida*  
    *elatinoides*  
    *Erinus*  
    *excisa*  
    *garganica*  
    *glomerata*  
    — var. *alba*  
    *Grossekii*  
    *haylodgensis*  
    *imeretina*  
    *lactiflora*  
    *latifolia*  
    — var. *macrantha*



*Campanula*—*cont.*

— var. *Van Houttei*  
— var. *versicolor*  
*latiloba*  
*Leutweinii*  
*lingulata*  
*linifolia*  
— var. *Berkeleyana*  
*longestyla*  
*macrorrhiza*  
*Marchesettii*  
*mirabilis*  
*Morettiana*  
*persicifolia*  
*Portenschlagiana*  
— var. *major*  
*pulla*  
*punctata*  
*Raddeana*  
*rapunculoides*  
*Rapunculus*  
*rhomboidalis*  
*rotundifolia*  
*sarmatica*  
*sibirica*  
*speciosa*  
*Stansfieldii*  
*Stevenii*  
*thyrsoides*  
*Trachelium*  
*Tymonsii*  
*versicolor*  
*Waldsteiniana*

*Capsella* *Bursa-pastoris*  
*grandiflora*

*Cardamine* *chenopodifolia*  
*pinnata*  
*trifolia*

*Carduncellus* *coeruleus*

*Carduus* *arctioides*  
*crispus*  
*defloratus*  
*Kernerii*  
*nutans*  
*stenolepis*  
*tenuiflorus*

*Carex* *acuta*  
*acutiformis*  
*alopecoidea*  
*arctata*  
*depauperata*  
*distans*  
*divulsa*  
*flava*  
*grisea*  
*helodes*  
*leporina*  
*longirostris*  
*pendula*  
*rupestris*  
*remota*  
*tomentosa*  
*trichocarpa*

*Carlina* *acanthifolia*  
*acaulis*  
— var. *caulescens*  
*vulgaris*

*Carthamus* *leucocaulos*  
*tinctorius*

*Carum* *Carvi*

*Caulophyllum* *thalictroides*

*Cedronella* *cana*

*Celmisia* *discolor*

*Celsia* *betonicaefolia*

*Cenchrus* *tribuloides*

*Cenia* *turbinata*

*Centaurea* *amara*  
*americana*  
*aspera*  
*Cyanus*  
*cynaroides*  
*dealbata*  
*depressa*  
*glastifolia*  
*hypoleuca*

**Centaurea—cont.**

Jacea  
macrocephala  
melitensis  
montana  
— var. alba  
— var. lugdunensis  
moschata  
nigra  
nigrescens var. vochinensis  
phrygia  
pulchra  
ruthenica  
Sadleriana  
Scabiosa var. alba  
Triumfettii  
Urvillei

Cephalaria alpina  
leucantha  
syriaca  
tatarica  
transylvanica

Cerastium alpinum  
— var. lanatum  
Biebersteinii  
Boissieri  
grandiflorum  
ovatum var. lanceolatum  
perfoliatum  
purpurascens  
tomentosum

Cerintho aspera  
glabra  
major  
minor

Chaerophyllum nodosum

Chaeturus fasciculatus

Chamaelirium luteum

Cheiranthus semperflorens

Chelidonium majus  
— var. laciniatum

Chelone glabra  
nemorosa

Chenopodium album  
Bonus-Henricus  
serotinum  
urbicum

Chorispora tenella

Chrysanthemum arcticum  
Aucherianum  
Balsamita  
— var. tomentosum  
caucasicum  
ceratophylloides  
cinerariaefolium  
coronarium  
corymbosum  
densum  
lacustre  
macrophyllum  
maximum  
monspeliense  
Myconis  
pallens  
segetum  
Zawadskii

Chrysogonum virginianum

Chrysopogon Gryllus

Cicer pinnatifidum

Cimicifuga cordifolia  
dahurica  
foetida  
japonica  
racemosa

Cirsium afrom  
arachnoideum  
Diacantha  
eriphorum  
lanceolatum  
monspessulanum  
oleraceum

Cladium Mariscus	Corydalis cheilanthifolia
Clarkia elegans pulchella	glauca tomentella tuberosa vesicaria
Claytonia sibirica	Corynephorus canescens
Cleome violacea	Cosmos bipinnatus
Clypeola Jonthlaspii	Cotula coronopifolia
Cochlearia anglica glastifolia officinalis	Cotyledon chrysantha libanotica
Codonopsis ovata sylvestris	Crambe cordifolia maritima orientalis pinnatifida
Colchicum byzantinum umbrosum	Craspedia uniflora
Collinsia bicolor	Crepis alpina biennis blattarioides conyzifolia Dioscoridis foetida incana rubra setosa sibirica
Collomia coccinea gilioides grandiflora	Crocus aerius asturicus Balansae banaticus biflorus — var. Weldenii byzantinus chrysanthus dalmaticus Imperati laevigatus longiflorus medius nudiflorus ochroleucus reticulatus var. micranthus
Commelina coelestis	
Conringia orientalis	
Convallaria majalis — var. prolificans	
Convolvulus siculus tricolor undulatus	
Coreopsis grandiflora lanceolata tinctoria	
Corispermum hyssopifolium	
Coronilla cappadocica elegans montana scorpioides	

*Crocus—cont.*

Salzmannii  
speciosus  
stellaris  
Tommasinianus  
vernus  
versicolor  
zonatus

*Crupina vulgaris*

*Cucubalus baccifer*

*Cuphea lanceolata*

*Cynara Cardunculus*  
*Scolymus*

*Cynoglossum furcatum*  
*pictum*  
*Wallichii*

*Cynosurus cristatus*  
*echinatus*

*Cypripedium spectabile*

*Dactylis glomerata*

*Dahlia coccinea*  
*Merckii*  
*variabilis*

*Datisca cannabina*

*Datura Metel*  
*Stramonium*  
*Tatula*

*Delphinium altissimum*  
*atropurpureum*  
*carolinianum*  
*cashmirianum*  
*caucasicum*  
*decorum*  
*Delavayi*  
*dyctiocarpum*  
*elatum*  
— var. *alpinum*

*Delphinium—cont.*

*flexuosum*  
*formosum*  
*Gayanum*  
*grandiflorum*  
— var. *album*  
*scopulorum*  
*speciosum*  
*sulphureum*  
*tatsienense*  
*variegatum*  
*vestitum*

*Deschampsia caespitosa*  
— var. *vivipara*  
*flexuosa*

*Desmazeria sicula*

*Desmodium canadense*  
*canescens*

*Dianthus alpinus*  
*anatolicus*  
*arenarius*  
*Armeria*  
*arvernensis*  
*atrorubens*  
*banaticus*  
*caesius*  
— var. *grandiflorus*  
*callizonus*  
*Caryophyllus*  
*chinensis*  
— var. *Heddewigii*  
*croaticus*  
*cruentus*  
*Cyrii*  
*deltoides*  
*fragrans*  
*furcatus*  
*gallicus*  
*giganteus*  
*glacialis*  
*hirtus*  
*hyssopifolius*  
*Knappii*  
*leptopetalus*  
*lusitanicus*

*Dianthus*—*cont.*

moesiacus  
neglectus  
Noeanus  
pallens  
Pancicii  
petraeus  
— var. *spiculifolius*  
pinifolius  
plumarius  
pubescens  
pungens  
Requienii  
squarrosus  
strictus  
subacaulis  
superbus  
— var. *Wimmeri*  
sylvestris  
— var. *frigidus*  
tener  
tenuiflorus  
tenuis  
Waldsteinii  
zonatus

*Dictamnus albus*

— var. *caucasicus*

*Digitalis ambigua*

dubia  
ferruginea  
flava  
lutea  
mariana  
purpurea

*Dimorphotheca aurantiaca*

hybrida  
pluvialis

*Diplachne fusca*

*Diplotaxis muralis*  
*tenuifolia*

*Dipsacus asper*  
*fullonum*  
*laciniatus*

*Disporum oreganum*  
*trachycarpum*

*Dodecatheon Clevelandii*

Jeffreyi  
Meadia  
radicatum

*Doronicum hungaricum*

Pardalianches  
plantagineum

*Downingia elegans*

*Draba aizoides*

Aizoon  
Athoa  
Bertolonii  
grandiflora  
hirta  
incana  
— var. *Adamsii*  
Loiseleurii  
olympica  
rigida  
rupestris  
siliquosa  
stellata

*Dracocephalum grandiflorum*

Isabellae  
Moldavica  
nutans  
peregrinum  
tanguticum  
thymiflorum

*Dryas Drummondii*

octopetala  
— var. *lanata*  
Sundermanni

*Ecballium Elaterium*

*Echinacea purpurea*

*Echinaria capitata*

*Echinocystis lobata*

Echinops banaticus  
dahuricus  
echinatus  
exaltatus  
niveus  
sphaerocephalus

Echium vulgare

Eleocharis palustris

Elsholtzia cristata

Elymus arenarius  
canadensis  
condensatus  
europaeus  
giganteus  
sabulosus  
uralensis  
virginicus

Emilia flammea

Epilobium alpinum  
angustifolium  
Dodonaei  
hirsutum  
Lamyi  
latifolium  
montanum  
nummularifolium  
rosmarinifolium

Epimedium Musschianum

Epipactis palustris

Eranthis cilicica  
hyemalis

Eremurus altaicus  
himalaicus  
robustus  
spectabilis

Erianthus Hostii

Erigeron aurantiacus  
bellidifolius  
glabellus  
glaucus  
Howellii  
leiomorus  
macranthus  
multiradiatus  
philadelphicus  
pulchellus  
uniflorus

Erinus alpinus

Eriogonum compositum  
racemosum  
subalpinum  
— var. major  
umbellatum

Eriophorum Scheuchzeri  
vaginatum

Erodium alpinum  
Botrys  
carvifolium  
cheilanthifolium  
chrysanthum  
corsicum  
gruinum  
hymenodes  
macradenum  
malacoides  
Manescavii  
petraeum  
Salzmanni  
supracanum  
supradenum x

Erophila vulgaris

Eruca sativa

Eryngium alpinum  
Bourgatii  
giganteum  
glaciale  
Oliverianum

*Erysimum cheiranthoides*  
  *hieracifolium*  
  *Perofskianum*  
  *purpureum*  
  *rupestre*

*Erythraea Centaurium*

*Erythronium Dens-Canis*  
  *Hendersonii*  
  *revolutum*

*Eschscholzia caespitosa*  
  *californica*  
  *Douglasii*

*Eucharidium concinnum*

*Eupatorium cannabinum*  
  *purpureum*

*Euphorbia chamaesyce*  
  *epithymoides*  
  *Esula*  
  *exigua*  
  *helioscopia*  
  *Lathyris*  
  *stricta*

*Felicia Bergiana*  
  *fragilis*  
  *rotundifolia*

*Ferula communis*  
  *orientalis*  
  *sulcata*  
  *sylvatica*

*Festuca arundinacea*  
  *Eskia*  
  *glauca*  
  *Myuros*  
  *ovina* var. *tenuifolia*  
  *pratensis*  
  *spectabilis*  
  *uniglumis*

*Filipendula hexapetala*  
  *Ulmaria*

*Fragaria chiloensis*  
  *indica*  
  *virginiana*

*Fritillaria acmopetala*  
  *Elwesii*  
  *latifolia*  
  *Meleagris*  
  — var. *alba*  
  *latifolia*  
  *Olivieri*  
  *pyrenaica*  
  *tenella*

*Fumaria officinalis*  
  *parviflora*  
  *Vaillantii*

*Funkia Fortunei*  
  *longipes*  
  *Sieboldiana*

*Gaillardia amblyodon*  
  *lanceolata*

*Galanthus byzantinus*  
  *Elwesii*  
  *Ikariae*  
  *nivalis* var. *Imperati*  
  *plicatus*

*Galega officinalis*  
  *orientalis*  
  *patula*

*Galeopsis dubia*  
  *pyrenaica*  
  *speciosa*  
  *Tetrahit*

*Galinsoga parviflora*

*Galium boreale*  
  *purpureum*  
  *tricorne*  
  *verum*

*Gentiana asclepiadea*  
  — var. *alba*

*Gentiana*—*cont.*

dahurica  
decumbens  
— var. alba  
Fetisowii  
Freyniana  
frigida  
gelida  
Grombezowskii  
hexaphylla  
lagodechiana  
macrophylla  
septemfida  
straminea  
tibetica  
verna

*Geranium* albiflorum

angulatum  
armenum  
Bergianum  
cinereum  
dissectum  
Endressii  
eristemon  
Farreri  
grandiflorum  
ibericum  
incisum  
macrorrhizum  
maculatum  
nodosum  
palustre  
phaeum var. lividum  
pratense  
— var. album  
Richardsonii  
rivulare  
Robertianum  
— var. album  
rotundifolium  
sanguineum  
sessiliflorum  
silvaticum  
subcaulescens  
versicolor  
Wallichianum  
yedoense

*Gerbera* Anandria

*Geum* album

Boissieri  
bulgaricum  
chiloense  
coccineum  
elatum  
Heldreichii  
intermedium  
Jankae  
japonicum  
molle  
parviflorum  
Purdomii  
pyrenaicum  
radiatum  
reptans  
rhaeticum  
rivale  
Rossii  
triflorum  
urbanum

*Gilia* abrotanifolia

achilleaefolia  
aggregata  
capitata  
Davyi  
densiflora  
laciniata  
liniflora  
micrantha var. rosea  
multicaulis  
tricolor  
— var. alba

*Gillenia* trifoliata

*Gladiolus* atroviolaceus  
byzantinus

*Glaucium* corniculatum

*Globularia* cordifolia  
trichosantha  
vulgaris



*Glyceria maritima*  
nervata

*Glycine* Soja

*Glycyrrhiza echinata*  
glabra  
lepidota

*Grindelia speciosa*  
squarrosa

*Gunnera chilensis*  
manicata

*Gypsophila cerastioides*  
elegans  
paniculata  
prostrata  
repens

*Hablitzia tamnoides*

*Hebenstretia dentata*  
tenuifolia

*Hedysarum coronarium*  
esculentum  
flavescens  
Hedysaroides

*Helenium autumnale* var.  
pumilum  
Bolanderi  
tenuifolium

*Helianthella quinquenervis*

*Helianthemum alpestre*  
canum  
guttatum  
pulverulentum  
Tuberaria  
vineale

*Helianthus coloradensis*  
debilis  
decapetalus  
mollis

*Helianthus—cont.*  
Nuttallii  
occidentalis  
parviflorus  
rigidus

*Helichrysum bellidioides*  
bracteatum  
frigidum  
serotinum

*Heliopsis scabra*

*Helipterum Humboldtianum*  
Manglesii  
roseum

*Helleborus foetidus*  
viridis

*Helonias bullata*

*Hemerocallis aurantiaca*  
citrina  
flava  
Forrestii  
Middendorffii  
nana  
Thunbergii

*Heracleum candicans*  
flavescens  
villosum

*Herniaria hirsuta*

*Heuchera americana*  
bracteata  
Drummondii  
glabra  
micrantha  
pilosissima  
pubescens  
undulata

*Hibiscus Trionum*

*Hieracium amplexicaule*  
anglicum

**Hieracium—cont.**

aurantiacum  
bombycinum  
bupleuroides  
cappadocicum  
crocatum  
eriophorum  
gymnocephalum  
humile  
Jankae  
maculatum  
pallidum  
pannosum  
Pilosella  
scorzoneraefolium  
tridentatum  
umbellatum  
villosum  
vulgatum

Horminum pyrenaicum

Hutchinsia alpina  
— var. album

Hyacinthus azureus  
hispidus  
orientalis  
romanus

Hydrophyllum virginicum

Hyoscyamus niger

Hypocoum procumbens

Hypericum confertum  
Desetangsii  
dubium  
elegans  
elodioides  
fragile  
hirsutum  
Kotschyanum  
montanum  
nummularium  
olympicum  
orientale  
perforatum

**Hypericum—cont.**

polyphyllum  
pulchrum  
quadrangulum  
rhodopeum  
rumelicum

Hyssopus officinalis  
— var. aristatus

Hystrix patula

Iberis amara  
Jordanii  
pinnata  
sempervirens  
— var. Garrexiana  
umbellata

Impatiens Roylei  
scabrida

Incarvillea Delavayi  
grandiflora

Inula barbata  
Britannica  
cordata  
ensifolia  
Helenium  
hirta  
Hookeri  
magnifica  
montana  
orientalis  
racemosa  
salicina  
spiraeifolia  
squarrosa

Ionopsidium acaule

Iris bucharica  
Bulleyana  
chrysographes  
Clarkei  
Delavayi  
dichotoma  
Douglasiana

Iris—*cont.*  
     flavissima  
     foetidissima  
     — var. citrina  
     Forrestii  
     graminea  
     Kaempferi  
     laevigata  
     longipetala  
     Milesii  
     missouriensis  
     orientalis  
     persica var. stenophylla  
     Pseudacorus  
     pumila  
     Reichenbachii  
     reticulata var. cyanea  
     — var. histrioides  
     setosa  
     sibirica  
     — var. acuta  
     — var. alba  
     — var. coreana  
     stolonifera  
     variegata  
     versicolor  
     Wilsonii  
     Xiphium

Isatis glauca  
     tinctoria

Isopyrum fumarioides

Iva xanthifolia

Ixiolirion montanum var.  
     tataricum

Jasione perennis

Juncus alpinus  
     bufonius  
     Chamissonis  
     compressus  
     glaucus  
     squarrosus

Jurinea arachnoidea  
     cyanoides

Kentranthus Calcitrapa  
     ruber  
     — var. albus

Kitaibelia vitifolia

Kochia trichophila

Koeleria albescens  
     cristata  
     phleoides

Kohlrauschia prolifera

Lactuca alpina  
     Bourgaei  
     macrophylla  
     perennis  
     Plumieri  
     virosa

Lagurus ovatus

Lallemantia canescens

Lamium album  
     Galeobdolon  
     maculatum  
     — var. album  
     — var. rugosum  
     Orvala

Lapeyrousia cruenta  
     — var. alba

Laserpitium gallicum  
     latifolium  
     peucedanoides  
     Siler

Lathyrus angulatus  
     Aphaca  
     articulatus  
     cicera  
     cirrhosus  
     clymenum

*Lathyrus*—*cont.*  
*filiformis*  
*grandiflorus*  
*heterophyllus*  
*latifolius*  
*luteus*  
*maritimus*  
*montanus*  
*niger*  
*Nissolia*  
*odoratus*  
*palustris*  
*pisiformis*  
*roseus*  
*rotundifolius*  
*rotundifolius* x *tuberosus*  
*sativus*  
*setifolius*  
*sphaericus*  
*sylvester*  
*tingitanus*  
*tuberosus*  
*venosus*  
*vernus* var. *flaccidus*  
  
*Lavatera arborea* var. *alba*  
*cachemiriana*  
*Olbia*  
*thuringiaca*  
*trimestris*  
  
*Layia elegans*  
  
*Legousia falcata*  
*pentagonia*  
*speculum-veneris*  
  
*Leontodon hastilis*  
*hirtus*  
*hispidus*  
  
*Leontopodium alpinum*  
  
*Leonurus Cardiaca*  
*sibiricus*  
  
*Lepachys pinnata*

*Lepidium Draba*  
*Menziesii*  
*sativum*  
  
*Leptosyne Bigelovii*  
*Douglasii*  
*maritima*  
*Stillmannii*  
  
*Leucojum aestivum*  
*hyemale*  
*vernum*  
  
*Levisticum officinale*  
  
*Liatris pycnostachya*  
*scariosa*  
  
*Libertia formosa*  
*grandiflora*  
  
*Ligusticum scoticum*  
  
*Lilium pomponium*  
*pyrenaicum*  
*tenuifolium*  
  
*Limnanthes alba*  
*Douglasii*  
  
*Limonium confusum*  
*Gmelinii*  
*minutum*  
*vulgare*  
  
*Linaria alpina*  
*genistifolia*  
*heterophylla*  
*italica*  
*maroccana*  
*organifolia*  
*purpurea*  
*repens*  
*supina*  
— var. *pyrenaica*  
*triornithophora*  
*triphylla*  
*tristis*  
*viscida*

*Lindelofia longifolia*

*Linum alpinum*

arboreum  
austriacum  
capitatum  
catharticum  
gallicum  
grandiflorum  
monogynum  
narbonense  
perenne  
tenuifolium  
usitatissimum

*Lithospermum intermedium*

*Loasa triphylla*  
vulcanica

*Lobelia Erinus*  
sessilifolia  
syphilitica  
tenuior

*Lolium temulentum*

*Lopezia coronata*

*Lotus corniculatus*  
edulis  
ornithopodioides  
Requienii  
siliquosus  
tenuifolius  
Tetragonolobus

*Lunaria annua*  
— var. *alba*

*Lupinus angustifolius*  
Barkeri  
concinnus  
densiflorus  
Hartwegii  
micranthus  
mutabilis  
nanus  
nootkatensis

*Lupinus—cont.*

onustus  
Paynei  
perennis  
pilosus  
polyphyllus  
texensis var. *subcarnosus*

*Luzula Fosteri*  
nivea

*Lychnis alba*  
alpina  
chalcedonica  
Coeli-rosa  
— var. *elegans*  
coronaria  
— var. *oculata*  
coronata  
corsica  
dioica  
Flos-jovis  
Githago  
pyrenaica  
Sartori  
Sermo  
Viscaria

*Lycopersicum esculentum*  
— var. *cerasiforme*  
pyriforme

*Lycopsis europaeus*  
exaltatus

*Lysichitum camtschaticum*

*Lysimachia barystachys*  
punctata  
stricta  
vulgaris

*Lythrum Salicaria*  
— var. *rosea*

*Macleaya cordata*  
microcarpa

*Madia dissitiflora*  
elegans

**Malope trifida**

**Malva alcea**

crispa

moschata

rotundifolia

silvestris

— var. alba

**Malvastrum limense**

**Mandragora officinarum**

**Marrubium supinum**

vulgare

**Matthiola bicornis**

sinuata var. glabra albi-  
flora

thessala

valesiaca

**Matricaria Tchihatchewii**

**Meconopsis betonicifolia**

cambrica

chelidonifolia

integrifolia

Prattii

quintuplinervia

racemosa

rudis

simplicifolia

**Medicago ciliaris**

falcata

hispida var. pentacycla

littoralis

lupulina

Murex

orbicularis

rigidula

sativa

scutellata

tuberculata

**Melanthium virginicum**

**Melica altissima**

— var. atropurpurea

ciliata

nutans

uniflora

**Melilotus albus**

indicus

officinalis

**Melissa officinalis**

**Mentha alopecuroidea**

aquatica

gentilis

longifolia

piperita

pratensis

rotundifolia

spicata

**Mertensia echioides**

oblongifolia

sibirica

**Mesembryanthemum**

pinnatifidum

pyropeum

**Meum athamanticum**

**Micromeria graeca**

**Microseris Lindleyi**

**Milium effusum**

**Mimulus Lewisii**

luteus

ringens

**Mirabilis divaricata**

Jalapa

**Miscanthus japonicus** var.

variegatus

**Mitella diphylla**

nuda

pentandra

<i>Modiola multifida</i>	<i>Nemophila insignis</i>
<i>Molinia coerulea</i>	<i>maculata</i>
— var. <i>variegata</i>	<i>Menziesii</i>
	— var. <i>discoidalis</i>
<i>Molopospermum peloponnesiacum</i>	<i>Nepeta concolor</i>
<i>Moltkia petraea</i>	<i>granatensis</i>
<i>Monarda didyma</i>	<i>macrantha</i>
<i>fistulosa</i>	<i>marifolia</i>
<i>Monolepis trifida</i>	<i>Mussinii</i>
<i>Moricandia arvensis</i>	<i>nervosa</i>
<i>Morina betonicoides</i>	<i>orientalis</i>
<i>Muscari armeniacum</i>	<i>ucranica</i>
<i>botryoides</i>	<i>Nicandra physaloides</i>
<i>commutatum</i>	<i>violacea</i>
<i>comosum</i>	<i>Nicotiana paniculata</i>
<i>compactum</i>	<i>rustica</i>
<i>conicum</i>	<i>Sanderae</i>
<i>latifolium</i>	<i>sylvestris</i>
<i>neglectum</i>	<i>Tabacum</i>
<i>paradoxum</i>	<i>Nigella arvensis</i>
<i>polyanthum</i>	<i>damascena</i>
<i>racemosum</i>	<i>hispanica</i>
<i>Myosotis pyrenaica</i>	<i>orientalis</i>
<i>Stabiana</i>	<i>sativa</i>
<i>Traversii</i>	<i>Oenanthe crocata</i>
<i>versicolor</i>	<i>fistulosa</i>
<i>Myosurus minimus</i>	<i>Lachenalii</i>
<i>Myrrhis odorata</i>	<i>silaifolia</i>
<i>Narcissus Bulbocodium</i>	<i>Oenothera acaulis</i>
<i>cyclamineus</i>	<i>Berteriana</i>
<i>minor</i>	<i>biennis</i>
— var. <i>nanus</i>	<i>fruticosa</i>
<i>triandrus</i>	<i>glauca</i>
<i>Nardostachys grandiflora</i>	<i>lepida</i>
<i>Nemesia strumosa</i>	<i>missouriensis</i>
<i>versicolor</i>	<i>pumila</i>
	<i>rosea</i>
	<i>Omphalodes linifolia</i>
	<i>Onobrychis Cristagalli</i>

*Ononis alopecuroides*  
arvensis  
biflora  
Natrix  
reclinata  
spinosa

*Onopordon Acanthium*  
tauricum

*Onosma albo-roseum*  
echioides  
stellulatum

*Ophiopogon intermedius*

*Opoponax Chironium*

*Orchis foliosa*  
maculata

*Origanum hirtum*  
hybridum  
Onites  
pulchrum  
vulgare

*Ornithogalum narbonense*  
nutans

*Ourisia macrocarpa*

*Oxalis divergens*  
enneaphylla

*Oxybaphus nyctagineus*

*Oxytropis argentea*  
baicalensis  
campestris  
lapponica  
strobilacea  
sulphurea

*Paeonia anomala*  
arietina  
Broteri  
Delavayi  
lutea x Delavayi

*Paeonia—cont.*  
Mlokosewitchii  
peregrina  
tenuifolia  
Veitchii  
Wittmanniana  
Woodwardii

*Palaua dissecta*  
malvaefolia

*Panicum amarum*  
capillare  
Crus-galli  
miliaceum  
obtusum  
Teneriffae

*Papaver alpinum*  
apulum  
Argemone  
caucasicum  
commutatum  
dubium  
glaucum  
hybridum  
lateritium  
macrostomum  
nudicaule  
orientale  
— var. bracteatum  
pavoninum  
pilosum  
Rhoeas var. latifolium  
rupifragum  
somniferum

*Paracaryum glochidiatum*  
heliocarpum

*Paradisea Liliastrum*  
— var. major

*Parietaria officinalis*

*Parnassia fimbriata*  
nubicola  
palustris



*Patrinia gibbosa*  
*palmata*

*Peltaria turkmena*

*Pennisetum macrourum*

*Pentstemon angustifolius*  
*arizonicus*  
*breviflorus*  
*campanulatus*  
*confertus*  
— var. *coeruleo-purpureus*  
*diffusus*  
*Eatonii*  
*gentianoides*  
*glaber*  
— var. *utahensis*  
*heterophyllus*  
*hirsutus*  
*humilis*  
*laevigatus*  
— var. *digitalis*  
*Palmeri*  
*Roezii*  
*Scouleri*  
*secundiflorus*  
*tubiflorus*

*Perezia multiflora*

*Petunia axillaris*

*Peucedanum coriaceum*  
*graveolens*  
*hispanicum*  
*Ostruthium*  
*sativum*  
*verticillare*

*Phacelia malvaefolia*  
*tanacetifolia*  
*viscida*  
*Whitlavia*

*Phaegasium lapsanoides*

*Phalaris paradoxa*  
*tuberosa*

*Phaseolus multiflorus*  
*tuberosus*  
*vulgaris*

*Phleum alpinum*  
*paniculatum*  
*phleoides*  
*tenuë*

*Phlomis alpina*  
*armeniaca*  
*tuberosa*  
*umbrosa*  
*viscosa*

*Phlox argillacea*  
*divaricata*  
— var. *canadensis*  
— var. *Laphamii*  
*ovata*  
— var. *carolina*  
*paniculata*  
*subulata*

*Physochlaina orientalis*

*Physospermum commutatum*

*Physostegia virginiana*

*Phyteuma canescens*  
*Carestiae*  
*Charmelii*  
*Halleri*  
*hemisphaericum*  
*limonifolium*  
*lobelioides*  
*nigrum*  
*orbiculare*  
— var. *austriacum*  
*Scheuchzeri*  
*Sieberi*  
*spicatum*  
*Vagneri*

*Phytolacca acinosa*  
*clavigera*  
*decandra*

*Picridium tingitanum*

*Picris echioides*

*Pilularia globulifera*

*Pisum arvense*

elatus

sativum

— var. *umbellatum*

*Plantago alpina*

*Coronopus*

*Lagopus*

*lanceolata*

*maritima*

*media*

*nivalis*

*Psyllium*

*Platycodon grandiflorum*

-- var. *Mariesii*

*Platystemon californicus*

*Pleurospermum Golaka*

*Poa caesia*

*caespitosa*

*compressa*

*flexuosa*

*nemoralis*

*pannonica*

*Podolepis acuminata*

*Podophyllum Emodii*

*peltatum*

*Polemonium boreale*

*carneum*

*coeruleum*

— var. *himalayanum*

*filicinum*

*foliosissimum*

*humile*

*mexicanum*

*reptans*

*sibiricum*

*Polygonatum biflorum*

*multiflorum*

*verticillatum*

*Polygonum affine*

*alpinum*

— var. *polymorphum*

— var. *songaricum*

*Bistorta*

*compactum*

*lanigerum*

*molle*

*orientale*

*rude*

*sericeum*

*virginianum*

*viviparum*

*Weyrichii*

*Polylepis ivesioides*

*Polypogon littoralis*

*monspeliensis*

*Portulaca grandiflora*

*Potentilla alchemilloides*

*ambigua*

*argentea* var. *calabra*

*arguta*

*argyrophylla*

— var. *atrosanguinea*

— var. *leucochroa*

*aurea*

*caulescens*

*Crantzii*

*crinita*

*Cryptotaeniae*

*dealbata*

*Delavayi*

*Detommassii*

*digitata*

*eriocarpa*

*fragarioides*

*fragiformis*

*fulgens*

*gelida*

*grandiflora*

*Griffithii*

*Potentilla—cont.*

Hippiana  
hirta  
Hopwoodiana  
leuconota  
libanotica  
Macnabiana  
Meyeri  
montenegrina  
multifida  
nepalensis var. minor  
nevadensis  
pennsylvanica  
recta  
— var. macrantha  
— var. palmata  
rivalis  
rupestris  
— var. pygmaea  
sericea  
speciosa  
supina  
tanacetifolia  
Thurberi  
tridentata  
villosa

*Poterium alpinum*

obtusum  
officinale  
Sanguisorba  
tenuifolium

*Pratia repens*

*Prenanthes purpurea*

*Primula aurantiaca*

Beesiana  
Beesiana x Bulleyana  
Bulleyana  
Burmanica  
capitata  
chrysopa  
Cockburniana  
denticulata  
— var. cashmiriana  
elatior  
farinosa

*Primula—cont.*

florindae  
Forrestii  
Fortunei  
frondosa  
Giraldiana  
grandis  
helodoxa  
involucrata var. caerulea  
japonica  
luteola  
marginata  
Menziesiana  
microdonta  
modesta  
Mooreana  
obovata  
officinalis  
Palinurii  
pubescens  
pulverulenta  
rosea  
saxatilis  
secundiflora  
Sieboldii  
sikkimensis  
sino-Listeri  
Smithiana  
spectabilis  
Veitchii  
vittata  
Wardii  
Wilsonii

*Prunella grandiflora*  
*vulgaris*

*Psoralea macrostachys*  
*orbicularis*

*Puschkinia scilloides*

*Ramondia pyrenaica*  
*serbica*

*Ranunculus aconitifolius*  
*alpestris*  
*amplexicaulis*  
*arvensis*

**Ranunculus—cont.**

auricomus  
Cymbalaria  
Flammula  
Gouanii  
lanuginosus  
Lenormandii  
Lingua  
millefoliatus  
muricatus  
parnassifolius  
parviflorus  
platanifolius  
repens  
sceleratus  
trilobus

**Raoulia subsericea**

Reseda alba  
lutea  
Luteola  
odorata  
Phyteuma  
virgata

**Rhagadiolus edulis**

Rheum acuminatum  
Alexandrae  
officinale  
palmatum  
Pichonii  
Rhaponticum  
spiciforme  
tataricum  
undulatum  
Webbianum

**Rodgersia aesculifolia**  
pinnata  
Purdomii

**Romulea Bulbocodium**

Rudbeckia ampla  
amplexicaulis  
lacinata  
maxima

**Rumex acetosa**  
albrusensis  
conglomeratus  
crispus  
flexuosus  
heterophyllus  
maritimus  
obtusifolius  
palustris  
Patientia  
pulcher  
salicifolius  
scutatus

**Salvia argentea**  
Beckeri  
bicolor  
candidissima  
clandestina  
glutinosa  
grandiflora  
hians  
Horminum  
japonica  
Jurascii  
lyrata  
pratensis var. Baumgar-  
tenii  
Schiedeana  
Sclarea  
superba  
sylvestris  
tiliaefolia  
Verbenaca  
verticillata  
virgata  
viscosa

**Sanicula europaea**

**Saponaria caespitosa**  
calabrica  
cerastioides  
lutea  
ocymoides  
— var. alba  
officinalis  
Vaccaria

*Satureia montana*

*Saussurea albescens*

denticulata  
discolor  
eriolepis  
hypoleuca  
pectinata  
salicifolia

*Saxifraga aizoides*

*Aizoon*

— var. *carinthiaca*  
— var. *cultrata*  
— var. *Malyi*  
— var. *minor*  
— var. *notata*  
— var. *Rex*  
— var. *Stabiana*

*Burseriana*

*calabrica*  
*cartilaginea* x *cochlearis*  
*cochlearis*  
— var. *minor*  
*cordifolia*  
*Cotyledon*  
*crustata*  
*cuneifolia*  
*decipiens*

— var. *compacta*

— var. *Steinmannii*

— var. *Sternbergii*

*Delavayi*

x *Gaudinii*

*Geum* var. *crenata*

— var. *dentata*

*granulata*

*Grisebachii*

*Haagii*

*hirsuta*

*Hostii* var. *altissima*

*lingulata*

— var. *Albertii*

— var. *australis*

— var. *lantoscana*

x *Macnabiana*

*marginata*

*moschata* var. *Rhei*

*muscoides*

*Saxifraga*—*cont.*

*mutata*

*pedatifida*

*pedemontana*

x *Petraschii*

*Portae*

*rotundifolia*

*sancta*

*tenella*

*Timbalii*

*Scabiosa anthemifolia* var.

*rosea*

*australis*

*brachiata*

*caucasica*

*Columbaria*

*daucoides*

*graminifolia*

*longifolia*

*macedonica* var. *lyrio-*

*phylla*

*ochroleuca*

*prolifera*

*Pterocephala*

*stellata*

*sylvatica*

*triniaefolia*

*vestina*

*Schizanthus pinnatus*

*retusus*

*Scilla bifolia* var. *alba*

*hispanica*

— var. *rubra*

*italica*

*Lilio-Hyacinthus*

*sibirica*

— var. *alba*

*Scirpus Eriophorum*

*lacustris*

*Scolymus hispanicus*

*maculatus*

*Scorpiurus sulcata*

*vermiculata*

Scorzonera hispanica

Scrophularia aquatica  
nodosa  
orientalis  
Scorodonia

Scutellaria alpina  
altissima  
galericulata  
indica var. japonica  
Tournefortii

Securigera Coronilla

Sedum acre  
Aizoon  
album  
Anacampseros  
Cepaea  
dumulosum  
Ellacombianum  
Ewersii  
heterodontum  
kamtschaticum  
Kirilowii  
maximum  
Middendorffianum  
reflexum  
roseum  
rupestre  
Semenovii  
spathulifolium  
spurium  
— var. album  
stoloniferum  
Telephium

Selinum tenuifolium  
vaginatum

Sempervivum arachnoideum  
beugesiacum  
Doellianum  
Funkii  
glaucum  
Laggeri  
Mettenianum  
Schottii

Sempervivum—*cont.*  
tectorum  
triste

Senecio abrotanifolius  
adonidifolius  
alpinus  
clivorum  
Doria  
Doronicum  
erucifolius  
japonicus  
Ledebourii  
Ligularia  
nemorensis  
Przewalskii  
saracenicus  
stenocephalus  
suaveolens  
uniflorus  
Veitchianus  
Wilsonianus

Serratula coronata  
heterophylla  
quinquefolia  
radiata  
tinctoria  
— var. monticola

Seseli Libanotis

Sesleria argentea  
autumnalis  
coerulea

Setaria glauca  
italica  
verticillata  
viridis

Sidalcea candida  
neomexicana

Silene alpestris  
ciliata  
compacta  
conica  
conoidea

*Silene*—*cont.*

cordifolia  
crassipes  
cretica  
Cucubalus  
Delavayi  
echinata  
elegans  
Elizabethae  
fimbriata  
fruticulosa  
fuscata  
gallica  
Hookeri  
italica  
linicola  
Muscipula  
noctiflora  
pendula  
quadrifida  
Reichenbachii  
rubella  
Saxifraga  
Sino-Watsonii  
squamigera  
tatarica  
vallesia  
viridiflora  
Zawadzki

*Siler trilobum*

*Silphium trifoliatum*

*Silybum Marianum*

*Sisymbrium Irio*  
orientale  
polyceratum  
strictissimum  
Thalianum

*Sisyrinchium angustifolium*  
bermudianum  
californicum  
filifolium

*Smilacina racemosa*

*Smyrnium perfoliatum*

*Solidago arguta*  
elongata  
juncea  
mollis  
nemoralis  
ohioensis  
Virgaurea  
— var. *cambrica*

*Sonchus arvensis*  
oleraceus  
paluster

*Sparganium simplex*

*Spartina alterniflora*  
Townsendii

*Sphaeralcea Fendleri*

*Spiraea Aruncus*  
camtschatica  
digitata  
Hacquetii  
palmata  
vestita

*Stachys annua*  
arenaria  
citrina  
coccinea  
grandiflora  
intermedia  
lanata  
recta  
setifera  
silvatica

*Stevia ovata*

*Stokesia cyanea*  
— var. *alba*

*Stipa Calamagrostis*  
capillata  
Jarava  
papposa  
pennata

*Streptopus distortus*

*Succowia balearica*

*Swertia longifolia*  
*perennis*

*Symphyandra pendula*  
*Wanneri*

*Symphytum officinale*  
*peregrinum*

*Tamus communis*

*Tanacetum argenteum*  
*boreale*

*Tellima grandiflora*

*Tetragonia expansa*

*Teucrium Botrys*  
*canadense*  
*Chamaedrys*  
*flavum*  
*lucidum*  
*montanum*  
*pyrenaicum*

*Thalictrum angustifolium*  
*aquilegifolium*  
*Chelidonii*  
*corynellum*  
*cultratum*  
*Delavayi*  
*dioicum*  
*Fendleri*  
*flavum*  
*foetidum*  
*glaucum*  
*minus*  
—var. *adiantifolium*  
—var. *purpurascens*  
*odoratum*  
*simplex*  
*squarrosum*

*Thermopsis fabacea*  
*lanceolata*  
*montana*  
*rhombifolia*

*Thymus Chamaedrys*  
*odoratissimus*  
*Serpyllum*  
*vulgaris*

*Tiarella cordifolia*

*Tinantia fugax*

*Tofieldia calyculata*  
*palustris*

*Tolmiea Menziesii*

*Tradescantia congesta*  
*reflexa*  
*virginiana*

*Tragopogon major*  
*orientalis*

*Trautvetteria palmata*

*Tricyrtis latifolia*  
*macropoda*

*Trifolium alpestre*  
*arvense*  
*elegans*  
*glomeratum*  
*hybridum*  
*incarnatum*  
*medium*  
*ochroleucum*  
*pannonicum*  
*physodes*  
*pratense*  
*repens*  
*rubens*  
—var. *atropurpureum*  
*stellatum*  
*subterraneum*



*Trigonella coerulea*  
     *corniculata*  
     *cretica*  
     *foenum-graecum*  
     *polycerata*  
     *radiata*  
  
*Trillium grandiflorum*  
  
*Tripsacum dactyloides*  
  
*Trollius altaicus*  
     *asiaticus*  
     *chinensis*  
     *dschungaricus*  
     *europaeus* var. *albidus*  
     — var. *Denyanus*  
     *laxus*  
     *Ledebourii*  
     *patulus*  
     *pumilus*  
     — var. *yunnanensis*  
     *sinensis*  
  
*Troximon laciniatum*  
  
*Tulipa australis*  
     *Batalinii*  
     *Billietiana*  
     *chrysantha*  
     *dasystemon*  
     *Gesneriana*  
     *Kaufmanniana*  
     *praestans*  
     *pulchella*  
     *Sprengeri*  
     *sylvestris*  
  
*Tunica Saxifraga*  
  
*Urospermum picroides*  
  
*Ursinia anthemoides*  
     *pulchra*  
  
*Urtica cannabina*  
     *dioica*  
     *pilulifera*  
     — var. *Dodartii*

*Uvularia grandiflora*  
     *perfoliata*  
  
*Valeriana baltica*  
     *montana*  
     *officinalis*  
     *Phu*  
     *pyrenaica*  
     *sambucifolia*  
  
*Valerianella eriocarpa*  
     *vesicaria*  
  
*Veratrum album*  
     *californicum*  
     *nigrum*  
     *viride*  
  
*Verbascum Blattaria*  
     *Chaixii*  
     *pannosum*  
     *phoeniceum*  
  
*Verbena bonariensis*  
     *erinoides*  
     *hispida*  
     *prostrata*  
     *urticaefolia*  
  
*Verbesina helianthoides*  
  
*Veronica Allionii*  
     *alpina*  
     *Anagallis*  
     *armena*  
     *austriaca*  
     *filifolia*  
     *fruticans*  
     *fruticulosa*  
     *gentianoides*  
     *grandis*  
     *guthriana*  
     *incana*  
     *incisa*  
     *longifolia*  
     *Lyallii*  
     *morrisonicola*  
     *nummularia*  
     *officinalis*

*Veronica—cont.*

orchidea  
orientalis  
pectinata  
peduncularis  
pinguifolia  
prostrata  
repens  
spicata  
Teucrium  
thracica  
Tournefortii  
virginica

*Vicia angustifolia*

atropurpurea  
calcarata  
grandiflora  
lutea  
melanops  
narbonensis  
Orobus  
pyrenaica  
sativa  
sepium  
sylvatica

*Vicia—cont.*

tenuifolia  
villosa

*Vincetoxicum fuscatum*

luteum  
nigrum  
officinale

*Viola blanda*

canadensis  
declinata  
lutea  
rugulosa  
rupestris  
tricolor var. nigra

*Volutarella muricata*

*Waldsteinia fragarioides*  
geoides

*Zephyranthes candida*

*Zygadenus elegans*

# TREES AND SHRUBS.

*Acanthopanax divaricatus*

Giraldii

Henryi

lasiogyne

leucorrhizus var. scaberula

sessiliflorus

setchuenensis

Simonii

*Acer cappodocicum*

circinatum

Heldreichii var. macropterum

hyrcanum

insigne

Lobelii

macrophyllum

monspessulanum

neglectum

nikoense

*Actinidia melanandra*

*Aesculus californica*

indica

*Alnus cordata*

elliptica

firma

glutinosa

hirsuta

incana

japonica

nitida

oregona

orientalis

serrulata

sinuata

tenuifolia

viridis

— var. mollis

*Amelanchier alnifolia*

asiatica

canadensis

florida

laevis

*Andrachne phyllanthoides*

*Andromeda polifolia*

*Aralia chinensis*

— var. glabrescens

*Arbutus Menziesii*

*Arctostaphylos Manzanita*

tomentosa

*Asimina triloba*

*Astragalus Tragacantha*

*Baccharis patagonica*

*Berberis actinacantha*

aggregata

— var. Prattii

angulosa

aristata

Beaniana

brachypoda

buxifolia

canadensis

Chitria

concinna

consimilis

Darwinii

diaphana

dictyophylla

— var. albicaulis

dubia

**Berberis—cont.**

Edgeworthiana  
Francisci-Ferdinandii  
Hookeri  
Julianae  
koreana  
Lecomtei  
Leichtlinii  
Lycium  
orthobotrys  
polyantha  
pruinosa  
sinensis  
Soulieana  
Stapfiana  
subcaulialata  
thibetica  
Thunbergii  
Tischleri  
Veitchii  
Vernae  
virescens  
Wilsonae  
yunnanensis

**Betula corylifolia**

davurica  
Delavayi var. Forrestii  
Ermanii  
— var. nipponica  
fruticosa  
humilis  
— var. kamtschatica  
Jacquemontii  
japonica  
— var. mandshurica  
lutea  
Medwediewii  
papyrifera  
— var. occidentalis  
populifolia  
pumila

**Bruckenthalia spiculifolia**

**Buddleia albiflora**

alternifolia  
Fallowiana  
nivea

**Buddleia—cont.**

stenostachya  
variabilis  
— var. amplissima  
— var. magnifica  
— var. nanhoensis  
— var. Veitchiana

**Bupleurum fruticosum**

**Buxus sempervirens**

**Callicarpa Giraldiana**  
japonica

**Calophaca wolgarica**

**Caragana ambigua**  
arborescens  
— var. Redowskii  
aurantiaca  
Boisii  
microphylla  
sophoraefolia

**Carpinus caroliniana**  
japonica  
orientalis  
Turczaninovii

**Caryopteris tangutica**

**Cassandra calyculata**

**Cassinia fulvida**  
Vauvilliersii

**Cedrus atlantica**  
Libani

**Celastrus articulatus**  
rugosus  
scandens

**Celtis glabrata**  
gracilis  
occidentalis  
pumila

*Cephalotaxus drupacea*  
Fortunei

*Cercis Siliquastrum*

*Chionanthus virginica*

*Cistus canescens*  
corbariensis  
cyprius  
heterophyllus  
hirsutus  
laurifolius  
monspeliensis  
nigricans  
populifolius  
villosus

*Clematis aethusifolia* var.  
latisecta  
campaniflora  
connata  
— var. *velutina*  
*Douglasii* var. *Scottii*  
*Fargesii*  
*Flammula*  
*fusca*  
*glauca* var. *akebioides*  
*Gouriana*  
*intermedia*  
*montana*  
— var. *rubens*  
*orientalis*  
*Pseudo-flammula*  
*Rehderiana*  
*serratifolia*  
*Spooneri*  
*Veitchiana*  
*virginiana*  
*Vitalba*  
*Viticella*

*Clerodendron Fargesii*

*Clethra acuminata*  
alnifolia  
— var. *Michauxii*  
— var. *paniculata*  
*barbinervis*  
*tomentosa*

*Colutea arborescens* var.  
bullata  
media  
orientalis

*Corema album*

*Coriaria japonica*

*Cornus alba*  
asperifolia  
Baileyi  
Bretschneideri  
candidissima  
controversa  
Hemsleyi  
macrophylla  
Nuttallii  
officinalis  
pubescens  
Purpusii  
sanguinea  
stolonifera

*Corokia virgata*

*Corylus chinensis*  
heterophylla

*Cotoneaster acuminata*  
acutifolia  
affinis  
amoena  
apiculata  
bacillaris  
— var. *obtusa*  
bullata  
buxifolia  
congesta  
Dammeri  
Dielsiana  
divaricata  
Franchetii  
frigida  
glaucophylla  
Harroviana  
hebephylla  
Henryana  
horizontalis

*Cotoneaster—cont.*

hupehensis  
lactea  
Lindleyi  
lucida  
melanocarpa  
— var. laxiflora  
microphylla  
— var. cochleata  
— var. thymifolia  
moupinensis  
multiflora  
— var. calocarpa  
obscura  
pannosa  
prostrata  
racemiflora  
rotundifolia  
rubens  
salicifolia  
— var. rugosa  
serotina  
Simonsii  
turbinata  
Wardii  
Zabelii

*Crataegus acutiloba*

ambigua  
arkansana  
asperifolia  
austromontana  
Beckwithae  
berberifolia  
Boyntonii  
Buckleyi  
canadensis  
Carrierei  
Chapmanii  
chlorosarca  
coccinea  
cordata  
coloradoides  
corporea  
cuneata  
densiflora  
dilatata  
Dippeliana  
durobrivensis

*Crataegus—cont.*

Egglestonii  
Ellwangeriana  
elongata  
ferentaria  
filipes  
Fisheri  
Forbesae  
Gaultii  
gloriosa  
infera  
integriloba  
intricata  
Jackii  
Jonesae  
Lambertiana  
Laurentiana  
lenta  
Macauleyae  
Macounii  
macracantha  
missouriensis  
modesta  
mollis  
neo-Canbyi  
orientalis  
pastorum  
populnea  
praecox  
pruinosa  
prunifolia  
punctata  
rivularis  
semi-orbiculata  
sera  
sinaica  
stipulosa  
succulenta  
tanacetifolia  
tomentosa  
verecunda  
Wattiana

*Cupressus Lawsoniana*

nootkatensis  
thyoides

*Cydonia cathayensis*

Maulei

*Cytisus albus* var. *durus*  
    *austriacus*  
    *grandiflorus*  
    *nigricans*  
    *praecox*  
    *purgans*  
    *purpureus*  
    *ratibonensis*  
    *scoparius*  
    — var. *Andreanus*  
    — var. *sulphureus*  
    *sessilifolius*  
    *supinus*

*Daboëcia polifolia*

*Daphne Mezereum*

*Davidia Vilmoriniana*

*Decaisnea Fargesii*

*Deutzia compacta*  
    *corymbosa*  
    *gracilis*  
    *longifolia*  
    *macrocephala*  
    *mollis*  
    *reflexa*  
    *scabra*  
    *Schneideriana* var.  
        *laxiflora*  
    *Sieboldiana*  
    *Vilmorinae*

*Diervilla florida*  
    *japonica*  
    *sessilifolia*  
    *venosa*

*Diospyros Lotus*

*Dipelta yunnanensis*

*Dorycnium hirsutum*

*Elaeagnus multiflora*  
    *umbellata*

*Empetrum nigrum*  
    — var. *scoticum*

*Enkianthus campanulatus*  
    *cernuus*  
    *Palibinii*  
    *perulatus*

*Erica arborea*  
    *australis*  
    *scoparia*  
    *stricta*  
    *Tetralix*  
    *Veitchii*

*Euonymus latifolius*  
    *lanceifolia*  
    *oxyphyllus*  
    *phellomana*  
    *planipes*  
    *radicans*  
    *Sieboldianus*  
    *ussuriensis*  
    *yedoensis*  
    — var. *Koehneana*

*Evodia hupehensis*

*Exochorda Giraldii* var.  
    *Wilsonii*  
    *macrantha*

*Fontanesia Fortunei*  
    *phillyraeoides*

*Forsythia europaea*

*Fraxinus coriacea*  
    *lanceolata*  
    *numidica*  
    *oregona*  
    *Ornus*  
    *parvifolia*  
    *velutina*

*Garrya elliptica*

*Gaultheria procumbens*  
    *pyrolloides*  
    *Shallon*

Gaylussacia resinosa

Genista aetnensis

hispanica

pilosa

radiata

sagittalis

tinctoria

— var. elatior

Halesia carolina

Halimodendron argenteum

Hamamelis virginiana

Helianthemum alpestre

alpinum

alyssoides

appeninum

formosum

halimifolium

hymettum

pilosum

vulgare

— var. rhodanthum

Hibiscus syriacus

— var. Hamabo

Hoheria Lyallii

— var. glabrata

Hydrangea arborescens

Bretschneideri

paniculata

petiolaris

radiata

— var. glabrescens

— var. setchuenensis

— var. Wilsonii

Hypericum Androsaemum

aureum

dubium

elatum

galioides

hircinum

inodorum

Hypericum—*cont.*

Kalmianum

patulum

— var. Henryi

uralum

Webbii

Ilex decidua

integra

verticillata

Indigofera Gerardiana

Jamesia americana

Jasminum Beesianum

humile

Wallichianum

Juglans cathayensis

nigra

Kalmia glauca

latifolia

Koelreuteria apiculata

Laburnum alpinum

vulgare

Ledum latifolium

palustre

Leiophyllum buxifolium

Leptospermum Liversidgei

pubescens

scoparium

Leucothoë Catesbaei

racemosa

Leycesteria formosa

Ligustrum compactum

Delavayanum

Ibota

insulare

ionandrum

yunnanense



*Lonicera alpigena*  
     *chaetocarpa*  
     *chrysantha*  
     — var. *turkestanica*  
     *conjugalis*  
     *deflexicalyx*  
     *floribunda*  
     *gynochlamydea*  
     *Hemsleyana*  
     *Henryi*  
     *hispida*  
     *iberica*  
     *involucrata*  
     *japonica*  
     *Koehneana*  
     *Ledebourii*  
     *longa*  
     *Maackii*  
     *minutiflora*  
     *Morrowii*  
     *muendeniensis*  
     *nigra*  
     *obovata*  
     *orientalis*  
     — var. *longifolia*  
     *prostrata*  
     *Ruprechtiana*  
     *segreziensis*  
     *similis* var. *Delavayi*  
     *subaequalis*  
     *Sullivantii* var. *hirsuta*  
     *syringantha*  
     *tatarica*  
     *trichosantha*  
     *Xylosteum*

*Lupinus arboreus*

*Lyonia ligustrina*

*Maackia amurensis*

*Magnolia glauca*  
     *hypoleuca*  
     *Lennei*  
     *parviflora*  
     *Soulangeana*  
     *tripetala*

*Menispermum canadense*

*Microglossa albescens*

*Muehlenbeckia axillaris*

*Myricaria germanica*

*Myrtus communis*  
     *Luma*

*Neillia amurensis*  
     *capitata*  
     *opulifolia*  
     *Torreyi*

*Nuttallia cerasiformis*

*Olearia albida*  
     *erubescens*  
     *furfuracea*  
     *Haastii*

*Ononis fruticosa*  
     *spinosa*

*Osmanthus Delavayi*

*Oxycoccus macrocarpus*

*Oxydendrum arboreum*

*Paliurus Spina-Christi*

*Paulownia Fargesii*

*Pernettya mucronata*

*Pertya sinensis*

*Petteria ramentacea*

*Phellodendron chinense*  
     *sachalinense*

*Philadelphus argyrocalyx*  
     *brachybotrys*  
     — var. *purpurascens*

*Philadelphus—cont.*

californicus  
coronarius  
Delavayi  
Falconeri  
incanus  
latifolius  
Lewisii  
Magdalenae  
pekinensis  
pubescens  
Satsumanus  
sericanthus  
speciosissimus  
tomentosus  
verrucosus  
Wilsonii

*Phillyrea angustifolia*

*Photinia Beauverdiana* var.  
notabilis  
villosa var. sinica

*Pieris floribunda*  
formosa  
japonica  
mariana

*Pinus Armandii*  
parviflora

*Piptanthus concolor*

*Platanus acerifolia*  
orientalis

*Potentilla davurica*  
fruticosa

*Prunus acida*  
australis  
Avium  
cerasifera var. divaricata  
emarginata  
eminens  
incisa  
japonica  
Mahaleb

*Prunus—cont.*

Maximowiczii  
serrulata  
tomentosa

*Ptelea isophylla*  
trifoliata

*Pterostyrax hispida*

*Pyracantha angustifolia*  
coccinea  
crenulata  
Gibbsii  
— var. yunnanensis  
Rogersiana

*Pyrus alnifolia*  
alpina var. superaria  
americana  
— var. nana  
arbutifolia  
Aucuparia var. Backhousei  
— var. moravica  
crataegifolia  
decurrens  
floribunda  
Folgeneri  
Halliana  
Hostii  
kansuensis  
Malus var. Niedwetzkyana  
Matsumurana  
Meinichii  
melanocarpa  
minima  
pekinensis  
pinnatifida  
pohuashanensis  
prunifolia  
rotundifolia  
Sargentii  
Scheideckeri  
scopularis  
sikkimensis  
Sorbus  
theifera  
Toringo  
— var. major

*Pyrus—cont.*

toringoides  
Tormalis  
Tschonoskii  
Vilmorinii  
yunnanensis var. Veitchii  
Zahlbruckneri  
Zumi

*Quercus* Ballota

conferta  
pontica  
rubra

*Raphiolepis* japonica

*Rhamnus* cathartica

crocea  
daurica  
Erythroxylon  
fallax  
Frangula  
imeretina  
petiolaris  
Purshiana  
spathulifolia  
utilis

*Rhododendron* aechmophyllum

amaurphyllum  
ambiguum  
brachycarpum  
californicum  
calostrotum  
cheilanthum  
concinnum  
Cuthbertii  
Davidsonianum  
decorum  
discolor  
ferrugineum  
flavidum  
halense  
Hanceanum  
hippophaeoides  
hylothreptum  
hypolepidotum  
impeditum

*Rhododendron—cont.*

keleticum  
ledoides  
lepidotum  
lysolepis  
maximum  
Metternichii  
micranthum  
oreotrephes  
orthocladum  
polylepis  
punctatum  
racemosum  
rigidum  
rubiginosum  
scintillans  
Smirnowii  
telmateum  
Traillianum  
Tschonoskii  
villosum  
virgatum  
yanthinum  
yunnanense

*Rhodotypos* kerrioides

*Rhus* verniciflua

*Ribes* alpinum

aureum  
cereum  
divaricatum  
futurum  
glutinosum  
holosericeum  
Koehneanum  
sanguineum  
stenocarpum  
Warscewiczii

*Robinia* Kelseyi

*Rosa* acicularis

alba  
arkansana  
baicalensis  
blanda

~~Rosa~~—*cont.*

calocarpa  
cinnamomea  
corymbulosa  
Davidii  
elegantula  
elymaïtica  
Fargesii  
glutinosa  
graciliflora  
gymnocarpa  
Hawrana  
Helenae  
Hugonis  
humilis  
involuta var. *Wilsonii*  
macrophylla  
mollis  
Moyesii  
multibracteata  
nutkana  
omeiensis  
— var. *atrosanguinea*  
— var. *polyphylla*  
— var. *pteracantha*  
pisocarpa  
Pokorniyana  
poterifolia  
pyrifera  
rubrifolia  
rugosa  
saturata  
Seraphinii  
sericea  
sertata  
setipoda  
Soulieana  
stylosa var. *evanida*  
Sweginzowii  
virginiana  
Webbiana  
Willmottiae  
Woodsii var. *Fendleri*

Rubus biflorus  
— var. *quinqueflorus*  
deliciosus  
fosculosus  
Giraldianus

Rubus—*cont.*

inopertus  
Koehneanus  
lasiostylus  
mesogaeus  
nigro-baccus  
occidentalis  
odoratus  
parvifolius var.  
Fraserianus  
phoenicolasius  
triphyllus  
xanthocarpus

Ruscus aculeatus

Ruta graveolens

Schizandra chinensis

Sciadopitys verticillata

Securinega fluggeoides  
ramiflora

Senecio compactus  
laxifolius

Skimmia japonica

Smilax excelsa  
scobinicaulis

Sophora viciifolia

Spartium junceum

Spiraea Aitchisonii  
arborea  
— var. *glabrata*  
betulifolia  
bracteata  
canescens  
discolor  
Lindleyana  
Miyabei  
mollifolia  
salicifolia  
sorbifolia var. *stellipila*

*Spiraea*—*cont.*  
    *tomentosa*  
    *Veitchii*  
    *Wilsonii*

*Staphylea Coulombieri*  
    *pinnata*

*Stranvaesia Davidiana*  
    - var. *undulata*  
    *salicifolia*

*Styrax americanus*  
    *Hemsleyanus*  
    *japonicus*  
    *Obassia*

*Symphoricarpus Heyeri*  
    *occidentalis*  
    *racemosus*  
    *rotundifolius*

*Syringa amurensis*  
    *Emodi*  
    *japonica*  
    *Julianae*  
    *Palabinihana*  
    *pekinensis*  
    *pinetorum*  
    *Potaninii*  
    *reflexa*  
    *Sweginzowii*  
    *tomentella*  
    *villosa*  
    *Wilsonii*

*Taxus cuspidata*

*Thuja orientalis*

*Vaccinium corymbosum*  
    *erythrocarpum*  
    *hirsutum*  
    *pennsylvanicum*  
    *simulatum*

*Veronica anomala*  
    *Colensoi*  
    *diosmifolia*  
    *glaucescens*  
    *laevis*  
    *pimeleoides*  
    *salicifolia*  
    *saxatilis*

*Viburnum acerifolium*  
    *betulifolium*  
    *burejaeticum*  
    *cotinifolium*  
    *dilatatum*  
    *Henryi*  
    *hupehense*  
    *lobophyllum*  
    *Opulus* var. *americanum*  
    *theiferum*  
    *Veitchii*

*Vitis Coignetiae*  
    *sinensis*  
    *vulpina*

*Xanthoceras sorbifolia*

*Zanthoxylum Bungei*  
    *piperitum*

*Zenobia speciosa*  
    — var. *pulverulenta*





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